HP 9000 Series 300 Computers

HEWLETT PACKARD

Configuration Reference Manual



Configuration Reference Manual

For HP 9000 Series 300 Computers

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Configuration Overview

Chapter 1

Introduction

The purpose of this guide is to help you select the appropriate HP 9000 Series 300 configuration for your application and also document the configurations that are available. Due to its comprehensive nature, this guide is intended for use primarily by Hewlett-Packard Sales Representatives (SR), Systems Engineers (SE) and Customer Engineers (CE).

HP SRs, SEs and CEs also receive updates to this information more frequently than it is republished. To assure a correct configuration, customers should always request a formal quotation from Hewlett-Packard rather than ordering from this Guide. You should have the following HP publications available for reference:

- **HP 9000 Series 300 Models 310 and 320 Hardware Technical Data** *(HP Pub. No. 5953-9572)*
- **HP 9000 Series 300 Pricing Information** (U.S. only) - A listing of Series 300 product numbers and prices. Does not include most configuration information. To be used only as a guideline; contact your local HP Sales Office for current prices and availability. *(HP Pub. No. 5953-9573(D))*

Additional publications containing technical data are listed in the appropriate sections of this guide.

Configuration Steps

To configure your system, follow these five steps:

1. Make a copy of the worksheets in this chapter. The worksheets for support services are separately available in the **System Implementation and Support Plan** *(HP Pub. No. 5953-5230)*.
2. Using **Chapter 2**, choose the applications, operating system and language software. Determine the memory (RAM) and disc space they require.
3. Using **Chapter 3**, choose the system processor. Determine whether a bundled system is more economical than configuring the system from components.
4. Using **Chapter 4**, choose the plug-in accessories, interfaces and peripherals.
5. Using **Chapter 5**, determine the training, consulting and ongoing hardware and software support services needs.

Appendix A contains detailed support, configuration and ordering information on all supported software, interfaces accessories and peripherals. It is organized in product number order and the product numbers appear on the bottom of each page for ease of reference.

Product Order List

The three columns at the right are for your convenience. Make several copies for large systems.

Product No., Option, or Part Number	Quantity	Description			

Stand-alone Software Worksheet

Product Number or Part Number	Media Option	Description	RAM Required	Disc Space Required
		Maximum RAM for any product		§§§§§§§§§
		Total disc space for all products	§§§§§§§§§	

BASIC Software Worksheet

Product Number or Part Number	Media Option	Description	RAM Required	Disc Space Required
BASIC system				
98603A		ROM BASIC 4.0		
98613B		RAM BASIC 4.0		
-	-	Sum of all binaries		
		Total RAM for system + binaries		§§§§§§§§§
		Total disc space for all components	§§§§§§§§§	
Applications				
-	-	Estimated size of user program		
		Max. RAM for BASIC + any program		§§§§§§§§§
		Total disc space for all products	§§§§§§§§§	

HP-UX Software Worksheet

Product Number or Part Number	Media Option	Description	RAM Required	Disc Space Required
HP-UX system				
97033A	022	HP-UX 5.0 system, complete (1.0M, 55M)		
98515A		HP-UX 5.1 AXE (1.0M, 10M)		
		HP-UX 5.1 Programming Env. (NA, 3M)		
		HP-UX 5.1 FORTRAN77 (NA, 2M)		
		HP-UX 5.1 HP Pascal (NA, 2M)		
		HP-UX 5.1 AGP/DGL (NA, 1M)		
		Total disc space for all components	§§§§§§§§§	
		Per-user allowance × no. of users		
-	-	Estimated size of user program(s)		
Applications				
		Max. RAM for HP-UX + all programs executing simultaneously		§§§§§§§§§
		Total disc space, all components	§§§§§§§§§	

Pascal Software Worksheet

Product Number or Part Number	Media Option	Description	RAM Required	Disc Space Required
Pascal system				
98615C		Pascal 3.1		
-	-	Sum of all optional modules used		
		Total RAM for system + modules		§§§§§§§§§
		Total disc space for all components	§§§§§§§§§	
Applications				
-	-	Estimated size of user program		
		Max. RAM for Pascal + any program		§§§§§§§§§
		Total disc space for all products	§§§§§§§§§	

Mainframe and Console Worksheet

This worksheet is for selecting your processor model, system console display and keyboard. A 46081A HP-HIL audio/extension is included in those cases where the video monitor has no speaker.

Check the configuration desired and enter the information on the **Product Order List**. Descriptions and precise ordering information (e.g. product number suffix letters) is found in **Appendix A**.

Model 310: 10 MHz 68010-based systems

Console Display	Order the 98561A Base System, plus	Order This Bundled System
☐ Medium resolution monochromatic	35731, 46020	98580A
☐ Medium resolution color	Option 003, 98543A, 35741, 46020	98581A
☐ High resolution monochromatic	Option 003, 98544A 98781A, 46020	NA
☐ High resolution color	Option 003, 98545A, 98782A, 46081A	NA
☐ Graphics display station	98700H Option 030, 1252-1112	NA
☐ Video compatibility interface	98546A, 35731	98580A Option 008
☐ RS-232C terminal	Option 003, RS-232C interface, supported terminal and cables	NA

Model 320: 16.6 MHz 68020-based systems

Console Display	Order the 98561B Base System, plus	Order This Bundled System
☐ Medium resolution monochromatic	98542A, 35731, 46020	NA
☐ Medium resolution color	98543A, 35741, 46020	NA
☐ High resolution monochromatic	98544A, 98781A, 46020	98582A
☐ High resolution color	98545A, 98782A, 46081A	98583A
☐ Graphics display station	98700H Option 030, 1252-1112	NA
☐ Video compatibility interface	98546A, 35731	NA
☐ RS-232C terminal	RS-232C interface, supported terminal and cables	NA

RAM Worksheet

Transfer the number of 98257A and 98256A RAM cards to the HP-DIO slot worksheet.

Computer Selected	Description	Standard RAM	RAM
□ 98561A	Model 310 base system	1.0 M	
□ 98580A	Model 310 monochromatic bundled system	1.0 M	
□ 98581A	Model 310 color bundled system	1.0 M	
□ 98561B	Model 320 base system	1.0 M	
□ 98582A	Model 320 monochromatic bundled system	2.0 M	
□ 98583A	Model 320 color bundled system	2.0 M	
	RAM required by largest system (from operating system worksheets)	§§§§§§§§§	
	Required RAM minus Standard RAM	§§§§§§§§§	
98257A	Number of 1.0 Mbyte cards required	§§§§§§§§§	
98256A	Number of 256 Kbyte cards required	§§§§§§§§§	

Peripherals Worksheet

As you enter each interface and peripheral product number here:

- Enter the product number and cable option number (if any) on the **Product Order List**.
- Enter the interface information in the **HP-DIO Slot** worksheet (next).
- Note any BASIC binaries or Pascal modules required to support the interface or peripheral. This information is found in the interface's and peripheral's entry in **Appendix A**.
- Check the interface and peripheral ordering information in **Appendix A** and enter any desired feature options and accessories on the Order List.

For built-in interfaces, simply enter "built-in". For multiple peripherals connected to the same bus or mux interface, group the peripherals on separate lines - enter the interface number only once.

Interface Product No.	Interface Cable	Peripheral Cable	Peripheral Product No.	Peripheral Description

HP-DIO Slot Worksheets

Use the following pair of tables to compute whether or not you have enough slots for your configuration. These tables do not address *system* slots because it is not presently possible to exceed the number of available system slots in a functioning configuration.

Accessory and I/O Slots Available

Copy the number of slots available for the mainframe and each expander into the right hand columns. Add both columns. Note that:

- 98561A Option 004 (delete HP-DIO backplane) leaves you with *no* capability to support any accessory or I/O cards, nor any expanders.
- Only one 98568A expander is supported, and one 98568A is included in the 98583A Model 320 bundled color system.
- The 9888A expander requires a *mainframe* or 98568A I/O slot. Because many cards (such as the 98625A high-speed HP-IB interface) are not supported in a 9888A expander, a 98568A expander is often required.

Computer or Expander	Description	Acces. Slots	I/O Slots	Acces. Slots	I/O Slots
98561A	Model 310 base system	4	2		
98561B	Model 320 base system	2	1		
98580A Option 008	Model 310 bundled B&W system adds 98546A card set	4 -2	2 -1	_____	_____
98581A Option 008	Model 310 bundled color system adds 98546A card set	4 -2	2 -1	_____	_____
98582A	Model 320 bundled B&W system	1	1		
98583A	Model 320 bundled color system	7	4		
98568A*	Series 300 expander	+8	+4		
9888A, 1st 9888A, 2nd	Mainframe interface Mainframe interface	-1 -1	-1 -1	_____	_____
Subtotal	**A: Mainframe/98568A slots**	-	-		
	9888A Expander				
9888A	1st Series 200 expander	+16	+8		
9888A	2nd Series 200 expander	+16	+8		
Subtotal	**B: 9888A available slots**	-	-		
Total	**A+B: Slots of all kinds**	-	-		

* Do not include the 98568A supplied in the 98583A bundle. That expander is already accounted for.

Next, fill out the table on the next page. Both the "A: Mainframe/98568A" and "A+B: Slots of all kinds" totals above must equal or exceed the totals from the next table. If you find that an expander is required, recalculate the above table.

If you are configuring a system with one or two 9888A expanders, and you find that you have enough total slots of all kinds, but not enough mainframe/98568A slots, consider moving the 98561-66530 human interface (Model 320 only) or 98546A (Option 008) video compatibility interface from the mainframe to the 9888A expander.

Accessory and I/O Slots Consumed

Copy the number of slots used by each card (multiplied by the number used) into the right hand columns. For each card which cannot be used in a 9888A expander, check the "No" box in the "9888A" column. Add all data in both "Slots Used" columns for the "Total" entry at the end of the table. Add both columns of checked data for the "Mainframe/98568A-only" subtotal.

Card product or part no.	Description	Slots Required		9888A	Slots Used	
		Acces.	I/O	Compat.?	Acces.	I/O
50961A#200	SRM/Coax interface	-1	-1	Yes		
98253A	EPROM progr. i/f	-1		Yes		
98255A	EPROM memory card	-1		No □		
98256A	256 Kbyte RAM card	-1		No □		
98257A*	1.0 Mbyte RAM card	-1		No □		
98259A	128K bubble card	-1		Yes		
98287A	98700H interface	-1	-1	No □		
98546A*	Video compat. i/f	-2	-1	Yes		
98561-66530*	Human interface	-1	-1	Yes		
98603A	ROM BASIC 4.0 card	-1		No □		
98620A/B*	DMA controller	-1		No □		
98622A	GPIO interface	-1	-1	Yes		
98623A	BCD interface	-1	-1	Yes		
98624A	HP-IB interface	-1	-1	Yes		
98625A*	High-speed HP-IB i/f	-1	-1	No □		
98626A	RS-232C serial i/f	-1	-1	Yes		
98627A	Color video i/f	-1	-1	Yes		
98628A	Datacomm i/f	-1	-1	Yes		
98629A	SRM/MUX i/f	-1	-1	Yes		
98630A	Breadboard i/f	-1	-1	Maybe □		
98633A	Multiprog. i/f	-1	-1	Yes		
98635A	Floating pt. card	-1		Yes		
98640A	ADC interface	-1	-1	Yes		
98642A	4-channel mux i/f	-1	-1	Yes		
98643A	LAN interface	-1	-1	Yes		
98644A	RS-232 serial i/f	-1	-1	Yes		
98691A	Prog. datacomm i/f	-1	-1	Yes		
98700H	<refer to 98287A>	-	-	-	-	-
9888A	<refer to previous table>	-	-	-	-	-
Subtotal	**A: Mainframe/98568A-only** (□ checked)	-	-	-		
Total	**A+B: Slots of all kinds**	-	-	-		

* Do not include cards supplied as system Options or as part of bundled systems. These are already accounted for in the mainframe/expander figures on the preceding page.

Operating Systems and Applications Software

Chapter 2

If you have not chosen an operating system, use the other Technical Supplements listed in this section to assist you. The following table summarizes the major features and differences of the Series 300 operating systems. You may choose more than one operating system to execute on the same computer. "Standard" means the feature or capability is included at no extra charge. "Available" means it is ordered as an extra-cost system option or as a separate product.

Series 300 Operating System Guide

Operating System Characteristic	BASIC	HP-UX	Pascal
Number of users supported	1	1,1...16*	1
Number of concurrent processes	1	84∞	1
Minimum RAM, bytes	512 K§	1.0 M	512 K
Maximum RAM, bytes	7.5 M	7.5 M	7.5 M
Device I/O and real-time capability†	Standard	Available	Standard
7-bit (ISO) national language support	NA	NA	NA
8-bit national language support	Standard	Standard	Standard
Program editor	Standard	Standard	Standard
Text editor	Available	Standard	Standard
Programming languages:			
Motorola 68000 Assembly	Callable	Available	Standard
BASIC	Standard	NA	NA
C	NA	Available	NA
FORTRAN77	NA	Available	Available‡
HPL	NA	NA	NA
HP Pascal	Callable	Available	Standard
Graphics software	Standard	Standard	Standard
File system directories structures:			
HP Logical Interchange Format (LIF)	Standard	Utility	Standard
soft volumes per LIF medium	1	1	1-30
Pascal Workstation 1.0 (WS1.0)	NA	NA	Standard
Series 300 HP-UX hierarchical	NA	Standard	NA
Access to SRM hierarchical (SDF)	Standard	Available	Standard
IEEE 802.3 or *Ethernet*™ LAN	NA	Available	NA

Detailed information about each software product is provided in **Appendix A.**

Ethernet is a trademark of Xerox Corp.

* This is a maximum figure and is configuration dependent.

§ 98603A ROM BASIC requires only 52 Kbytes.

† "Device I/O" refers to low-level I/O capabilities such as HP-IB instrument control and I/O card register read/write. "Real-Time" refers to capabilities such as I/O interrupt handling and precise timing and prioritization of tasks.

‡ This capability is available from an HP PLUS third-party software supplier.

∞ This is a configurable parameter. The maximum is limited by installed RAM.

Shared Resource Management (SRM) Operating System
This manual provides information on requirements for SRM access from a workstation executing the BASIC, HP-UX or Pascal Language Systems. The requirements for executing the SRM Operating System on the SRM Controller are given in **Appendix S** of the **HP 9000 Series 200 Configuration Information or Order Guide** *(HP Part No. 09800-90020)* and the **Shared Resource Management Planning Guide** *(HP Part No. 5953-9550)*.

Memory and Disc Requirements
RAM-based Series 300 operating systems must have enough memory to contain the operating system, optional resident (permanently loaded) software, utility programs/commands and application programs.

These operating systems are loaded from a mass storage device (e.g. disc). You must have a device which meets the minimum system requirements and is adequate for the application. The tables of this section show the minimum and recommended requirements for RAM and disc space.

Although the ROM-based systems can reduce the requirement for RAM, the ROM board occupies a backplane slot which would otherwise be available for RAM.

Media Options
Software distribution/update media types are summarized at the end of this chapter.

Stand-Alone Applications and Utilities

This section describes software packages which include their own operating system; that is, they can execute on a Series 300 computer which has no other operating system.

The execute-only systems in these products do not support program development or have the complete set of commands of the full language system. If you have the full operating system on which the application is based, you may wish to configure the application as an ordinary program in the full system. The "Reconfigurable" column of the following table indicates whether this is possible.

Minimum Stand-Alone Systems

A stand-alone application requires the same minimum equipment as its underlying operating system, except as noted. The minimum RAM and the total disc space (in bytes) used by the application are shown in the following table.

Stand-Alone Software Ordering Information and Storage Requirements

Description	Operating System	Recon-figur-able	Software Number or Product Number	Min. RAM	Disc Space
Test Tools	<Unique>	No	09800-12x00	256 K	1.3 M
Graphics Editor/200	Pascal 3.1	Yes	45537B	768 K	800 K
Picture Perfect*™	Pascal 3.0	Yes	45462B	512 K	1300 K
Diagraph*™	Pascal 3.0	Yes	45463B	512 K	1300 K
Context MBA*™ 2.4	Pascal 3.0	No	45481B	512 K	1.0 M
HP EGS 2.1 (English)	Pascal 3.1	Yes	98305A/R	2.0 M	10 M
HP EGS Photoplot N/C Drill	Pascal 3.1	Yes	98310A/R	2.0 M	10 K
HP EGS IGES Translator	Pascal 3.1	Yes	98311A/R	2.0 M	10 K
HP2392A/VT100™ emulator	Pascal 3.1	Yes	98791B	512 K	195 K
HP TechWriter 1.2	Pascal 3.1	Yes	98819A/R	512 K	768 K

Note - Those products based on Pascal 3.0 (rather than Pascal 3.1) execute only on the Model 310 and support only peripherals supported by Pascal 3.0.

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* These applications presently require the 98546A compatibility video interface.

Picture Perfect is a trademark of Computer Support Corporation.

Diagraph is a trademark licensed to Computer Support Corporation.

Context MBA is a trademark of Context Management Systems.

VT100 is a trademark of Digital Equipment Corp.

BASIC Language System

The **HP 9000 Series 200 and 300 BASIC 4.0 Language System**, a technical data sheet, contains specifications and characteristics of the HP BASIC system software and HP BASIC Language for Series 300 computers. *(HP Pub. No. 5953-9560)*

Minimum BASIC System

The minimum hardware configuration for a BASIC Language System (revision 4.0 or later) capable of program development is:

- any Series 300 computer with keyboard interface and keyboard. Native language keyboards are optional.
- a built-in, 98540-series video board/interface and monitor, or 98700H Option 030 display station.
- 512 Kbytes or more of total RAM for a RAM-based system or 256 Kbytes or more for a ROM-based system.
- one or more supported 3½-in. or 5¼-in. flexible disc drives cabled to a supporting interface (see **Appendix A**). No disc is required if the computer is connected to an SRM controller and another 3½-in. or 5¼-in. flexible disc is available for software installation and diagnostic support.

Suggested Accessories and Peripherals

Discs - The HP 9122D dual 3½-in. flexible disc is the suggested minimum. If you require more than 788 Kbytes of on-line storage, an SRM connection or a 10 Mbyte 9153A Winchester disc is suggested. The 9133H Option 001 Winchester disc can support co-resident BASIC, Pascal and HP-UX 5.1 systems.

Printers - The HP 2225A *Thinkjet* is suggested. The 2934A Opt. 046 provides impact printing plus slightly higher speed and quality. For letter quality printing, specify the 2686A *LaserJet* printer. For very high speed impact printing, choose one of the 2560-series printers. An SRM connection can provide shared printers and spooled printing.

Plotters - The HP 7470A (A-size, 2-pen) is the most economical. For B-size and/or 6-pen applications, choose the 7475A. For large-scale plotting, choose the 7580B or 7585B. For unattended plotting, choose the 7550A (B-size, 8-pen) or the 7586B (E-size, 8-pen). BASIC supports shared (spooled) plotters via SRM.

All of the above peripherals except the *LaserJet* may be connected to the built-in HP-IB interface. The computer is supplied with a single 1m HP-IB cable. For many peripherals, you must specify HP-IB cables such as the 10833A (1m) or 10833B (2m). The *LaserJet* is connected via RS-232C and has special cabling requirements.

Once developed, it is possible for a BASIC language application to execute in a system which has no keyboard or CRT; however, a keyboard interface must be present (Model 310 built-in or 98561-66530). The disc drive may also be omitted if the application uses 98255A EPROM or 98259A Bubble Memory as its mass-storage device.

BASIC Language System Planning Information

Complete ordering information for RAM and ROM BASIC are provided in **Appendix A** in the 98613B and 98603A sections, respectively. If you choose a 98580A bundled system (see **Section 3**), the RAM BASIC 4.0 system is included.

BASIC 4.0 Language System and Components	Bytes RAM	Disc Space
ROM-based BASIC 4.0 (minimum system)	52 K	None*
RAM-based BASIC 4.0 (minimum system)	279 K	237 K
Recommended storage	512 K	768 K
Language Extensions		
CLOCK - Real-time clock	4 K	4 K
ERR - English error messages	7 K	7 K
GRAPH - Basic graphics	46 K	43 K
GRAPHX - Graphics extensions	27 K	27 K
IO - Extended I/O	11 K	11 K
KBD - Keyboard extensions	13 K	12 K
KNB2_0 - BASIC 2.0 knob default	0 K	0 K
LEX - Lexical order	10 K	10 K
MS - Extended mass storage	9 K	9 K
MAT - Matrix operations	20 K	21 K
PDEV - Program development	13 K	13 K
SRM - Shared Resource Management	46 K	44 K
TRANS - TRANSFER statement	34 K	30 K
XREF - Cross reference statement	6 K	6 K
Interface card drivers		
BCD - 98623A Binary Coded Decimal	2 K	2 K
DCOMM - 98628A Data Communications (also 98629A & 50961A#200)	7 K	6 K
GPIO - 98622A Parallel I/O	5 K	5 K
FHPIB - 98625A Disc	2 K	2 K
HPIB - HP-IB (built-in or plug-in)	12 K	12 K
SERIAL - RS-232 (built-in or plug-in)	4 K	5 K
Mass storage device drivers		
BUBBLE - 98259A Bubble Memory	3 K	3 K
CS80 - CS/80 and SS/80 Disc	11 K	4 K
EPROM - 98253A EPROM card	4 K	4 K
HP9885 - HP 9885M/S Flexible Disc	7 K	7 K
DISC - AMIGO HP-IB discs	8 K	8 K
CRT display drivers		
CRTA - 98546A, 98204A/B, Model 216, 226, 236	11 K	4 K
CRTB - 98542A, 98543A, 98544A, 98545A, 98561-66511/12 (Model 310), 98287A (98700H), Model 237	18 K	6 K

* The discs supplied with ROM-based BASIC include the SRM DATACOMM and KNB2_0 binaries, utilities and examples. You can boot BASIC from SRM and "LOAD BIN" these binaries without having them present in the ROM system. The ROM board contains the entire resident BASIC system and all other binaries.

BASIC Utility and Applications Software Planning Information

The RAM requirement (in bytes) shown in the following table is for the (RAM) BASIC Language System *plus* the application.

Description (Prod. No. is instrument supported)	BASIC System Required	Software Part Number or Product Number	Bytes RAM	Disc Space
Text Editor/200[1]	2.0 - 4.0	45538B	512 K	<270 K
BASIC Compiled Subprogr. Utility*	4.0	98613-11x40	---	219 K
Graphics Presentations	3.0 - 4.0	98815A	512 K	786 K
Project Management	3.0 - 4.0	98817A	512 K	256 K
Statistics Library/200	3.0 - 4.0	98820A	512 K	2.5 M
Stat. Lib. Part I (of 98820A)	3.0 - 4.0	98820B	512 K	1.3 M
Stat. Lib. Part II (requires Part I)	3.0 - 4.0	98820C	512 K	1.3 M
Numerical Analysis	3.0 - 4.0	98821A	512 K	512 K

* The compilation must be done in the Pascal 3.0 or 3.1 Language System.

HP-UX Operating System

The **HP 9000 HP-UX Operating System**, a technical data sheet, contains specifications and characteristics of the Series 200, 300 and 500 HP-UX operating systems; FORTRAN77, C and HP Pascal languages *(HP Pub. No. 5953-4673)*. **HP-UX for HP9000 Series 300 - An Introduction to the Product** *(HP Pub. No. 5953-9562)* contains further information specific to the Series 300.

HP-UX is presently orderable in two versions: 5.0 and 5.1. The 5.0 system is an early-availability system supplied as a complete bundle of all the HP-UX components and is multi-user only. The 5.1 system is on longer availability and is orderable as separate components, in single or multi-user varieties.

Minimum HP-UX 5.0 System

The minimum hardware configuration for an HP-UX system of revision 5.0 (or later) is:

- any Series 300 computer model
- one of the following system console capabilities:
  - A built-in HP-HIL/HP-IB interface, 46020-series keyboard plus built-in, 98540-series or 98287A (98700H) video interface and compatible CRT monitor
  - A built-in, 98626A, 98628A*, 98642A or 98644A RS-232C serial interface, cable and supported terminal with a 24-line × 80-column display.
- 2.0 Mbytes or more of total RAM.
- a 98620B DMA board.
- one or more CS/80 winchester discs (See **Section 4**) with at least 55 Mbytes capacity.
- any supported ¼-in. cartridge tape drive, for software installation.

Minimum HP-UX 5.1 System

The minimum hardware configuration for an HP-UX operating system of revision 5.1 is:

- any Series 300 computer model
- one of the following system console capabilities:
  - A built-in HP-HIL/HP-IB interface, 46020-series keyboard plus built-in, 98540-series or 98287A (98700H) video interface and compatible CRT monitor
  - A 98626A, 98628A*, 98642A or 98644A RS-232C serial interface, cable and supported terminal with a 24-line × 80-column display.
- 1.0 Mbytes or more of total RAM.
- one or more SS/80 or CS/80 winchester discs (See **Section 4**) with adequate capacity for use as the system disc. The Application Execution Environment (AXE) requires a minimum of 10 Mbytes, the Programming Environment requires a system disc having at least 16 Mbytes and the complete HP-UX system requires at least 22 Mbytes.
- any supported double-sided (SS/80) 3½-in. flexible disc drive or supported ¼-in. cartridge tape drive, for software installation.

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* The 98628A is not supported by the boot ROM is is not recommended for use as system console interface.

Suggested Peripherals

Mass Storage - the 9153A (10 Mbytes) is the minimum AXE disc. The suggested minimum single-user disc is the 9133H Option 001 (22 Mbytes). The suggested minimum multi-user disc is the 7941A (23 Mbytes). The 9144A ¼-in. cartridge tape drive may be used in any configuration for installation and backup. If 9-track tape is required, the 7914ST Option 002 (132 Mbytes) is recommended.

Terminals - For text-only applications, choose 2392A terminals. For graphics, choose 2393A terminals. HP-UX also supports other HP personal computers as terminals, such as the *HP Touchscreen-II* and The Portable. The 98642A 4-channel RS-232C multiplexer interface is suggested for all terminals.

Printers - The most economical printer is the HP 2225A *ThinkJet*. For impact printing at slightly higher speed and quality, choose the 2934A Option 046. For high speed line printing, choose one of the 2560-series line printers. For letter-quality printing, choose the 2686A *LaserJet*.

Plotters - The 7470A (A-size, 2-pen) is the suggested minimum. For B-size and/or 6-pen applications, choose the 7475A. For large-scale plotting, choose the 7580B or 7585B. For unattended plotting, the 7550A (A/B size) and the 7586B (E-size) are available.

All of the above peripherals except the terminals and the *LaserJet* may be connected to a built-in HP-IB interface or 98624A interface. Discs, tapes and some printers may connect to a 98625 high-speed HP-IB interface. The computer is supplied with a single 1m HP-IB cable. A CS/80 disc is supplied with a 2 or 1m cable. For many peripherals, you must specify additional cables such 10833A (1m) or 10833B (2m). The *LaserJet* requires an RS-232C interface, and its cabling is described in **Appendix A.**

HP-UX 5.0 System Planning Information

Complete ordering information for HP-UX 5.0 is provided under 97033A in **Appendix A.** The 97033A HP-UX 5.0 system includes: AXE (including HP Windows/9000), multi-user programming environment (including MC680x0 assembler, C compiler, debuggers, *Starbase* graphics, async datacomm, and Device I/O Library), FORTRAN77 compiler, HP Pascal compiler, AGP/DGL graphics (but not the DGL Skeleton handler).

Description	Product Number	Bytes RAM	Disc Space
Multi-user HP-UX 5.0 system (supplied on ¼-in. cartridge tape)	97033A	2.0 M	55 M
The following is also strongly recommended Response Center Support (RCS) for HP-UX 5.0	97033A+H22		

HP-UX 5.1 Planning Information

Complete ordering information for HP-UX 5.0 is provided in **Appendix A** under the various product numbers listed below. HP-UX is not included in any bundled systems.

Description	Product Number	Bytes RAM	Disc Space
Series 300 Application Execution Environment (AXE)			
HP-UX single-user AXE	98515A	1.0 M	10 M
Series 300 Programming Environments			
Single-user Programming Environment (requires 98515A AXE)	98517A	None	3 M
Multi-user Programming Environment (does not require 98515A AXE)	98597A	None	3 M
Series 300 Programming Languages/Libraries (require 98517A or 98597A, per user-license)			
Single-user FORTRAN 77 Compiler	98518A	None	2 M
Multi-user FORTRAN 77 Compiler	98598A	None	2 M
Single-user HP Pascal Compiler	98519A	None	2 M
Multi-user HP Pascal Compiler	98599A	None	2 M
Single-user AGP/DGL Graphics	98520A	None	1 M
Multi-user AGP/DGL Graphics	98600A	None	1 M
Series 200/300 DGL Skeleton Handler	98683X	NA	____ K

The single-user system allows only two "tty" ports - two RS-232C ports or the built-in keyboard/CRT (internal terminal emulator or ITE) and one RS-232C interface to be used for any purpose. One normal user may *login* on either the ITE or the serial interface (if no ITE is present). The serial interface may also be used by *cu*, *uucp*, or *uux* regardless of whether a user is logged in on the ITE.

The multi-user system allows only 16 "tty" ports.

Multi-User Considerations

The previous tables are for a single-user HP-UX system and do not include memory required for your applications. A general rule for text processing applications is to add 256 Kbytes per user. For software development add 768 Kbytes per user.

You also need to allocate disc space for users of the system. If you have not computed (or have insufficent data to compute) disc space requirements for users, a general rule is to allow at least 5 Mbytes of disc space per user.

HP-UX Utility and Applications Software Planning Information

Complete ordering information on each of these products is provided in **Appendix A**. The RAM requirement for each application is for RAM in addition to the 1.0 Mbyte minimum required by HP-UX. This amount of memory only applies to the first user executing the application.

Description	HP-UX System Required	Software Part Number or Product Number	Bytes RAM	Disc Space
NS/9000 LAN software*	5.0	50951/52A/R	256 K	500 K
HP-UX SRM Utilities§ (*srmcp*)	5.0	98693A/R	39 K	307 K

Pascal Language System

The **HP 9000 Series 200 and 300 Pascal 3.1 Language System**, a technical data sheet, contains specifications and characteristics of the HP Pascal system software and HP Pascal Language for Series 200 and 300 computers *(HP Pub. No. 5953-9561)*. The **Pascal System Internals Documentation** data sheet *(HP Pub. No. 5953-9534)* describes the manual set available for system-level programmers.

Minimum Pascal System

The minimum hardware configuration for a Pascal 3.1 Language System suitable for software development is:

- any Series 300 computer with keyboard interface and 46020-series keyboard, plus a built-in, 98540-series or 98287A (98700H) video interface and compatible monitor. Local language keyboards are optional.
- 512 Kbytes or more of total RAM. 1.0 Mbytes is suggested if the system has less than 5 Mbytes of disc and is not connected to an SRM system.
- one or more supported 3½-in. or 5¼-in. flexible disc drives cabled to a supporting interface (see **Appendix A**). No disc is required if computer is connected to an SRM system and another 3½-in. or 5¼-in. disc drive is available for software installation and diagnostic support.

Suggested Peripherals

Discs - The HP 9122D dual flexible disc is the suggested minimum. To minimize exchanging of discs in a 512 Kbyte system, an SRM connection or a 10 Mb 9153A Winchester disc is suggested. HP EGS *requires* a system disc of at least 10 Mbytes. For co-residence with an HP-UX 5.1 system, choose a 9133H Option 001 Winchester disc.

Printers - The HP 2225A *Thinkjet* is the most economical. For impact printing at slightly higher speed and quality, choose the 2934A Opt. 046. For high speed impact printing, choose the 2560-series printers. Print spooling is available via an SRM connection. For letter-quality printing, choose the 2686A *LaserJet*.

Plotters - The HP 7470A (A-size, 2-pen) is the most economical. For B-size and/or 6-pen applications, choose the 7475A. For large-scale plotting, choose the 7580B or 7585B. For unattended plotting, choose the 7550A (B-size, 8-pen) or the 7586B (E-size, 8-pen). Pascal supports shared plotters via SRM.

All of the above peripherals except the *LaserJet* may be connected to the built-in HP-IB interface. The computer is supplied with a single 1m HP-IB cable. For the additional peripherals, you must specify HP-IB cables such as the 10833A (1m) or 10833B (2m). The *LaserJet* is interfaced via RS-232C and has special cabling requirements.

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* 50951/52 also requires one 98643A LAN interface card.

§ 98693 also requires one or more 50961A#200 or 98629A SRM interface cards.

Pascal System Planning Information

Complete ordering information is provided under 98613C in **Appendix A.** Pascal 3.1 is not included in any bundled systems.

Description	Bytes RAM	Disc Space
System as supplied	512 K	2.7 M
Minimum operating system	200 K	270 K
Libraries		
GRAPHICS - DGL graphics	100 K	203 K
FGRAPHICS - same, plus 98635A support	120 K	223 K
IO - I/O	20 K	60 K
LIBRARY - Miscellaneous routines	5 K	16 K
SEGMENTER - Overlay routine	4 K	9 K
I/O Drivers		
AMIGO - 8290x, 9121, 913xA/B/XV discs	8.5 K	--
BAT - Powerfail	2 K	--
BUBBLE - 98259A Bubble memory	4 K	6 K
CHOOK - 9836C/CS	2.5 K	--
CLOCK - Time of day clock	3 K	--
CRT - Series 200 CRT displays	8 K	--
CRTB - Model 237, 310, 320 CRT display	7 K	--
CS80 - CS/80 and SS/80 discs	9 K	--
DATA_COMM - 98628A Data Communications	6 K	8 K
DISC_HPIB - 98625A disc interface	7 K	--
DMA - 98620A/B direct memory access	2.5 K	--
EDRIVER - 98253A EPROM programmer	3 K	6 K
EPROMS - 98255A - EPROM memory	2 K	4 K
F9885 - 98622A/9885M/S Flexible disc	4 K	6 K
GPIO - 98622A General Purpose I/O	3 K	5 K
HPHIL - HP-Human Interface Loop	3 K	5 K
HPIB - Built-in/98624A HP-IB interfaces	6 K	--
MOUSE - 46060A HP-HIL mouse	2 K	4 K
PRINTER - List device support	4.5 K	--
RS232 - 98626/44A Serial	4 K	6 K
SRM - 98629A Shared Resource Manager	23 K	27 K
WS1.0 - Workstation 1.0 file system	11 K	--
Program Development		
ASSEMBLER§ - MC68000 assembler	70 K	73 K
COMPILER§ - Pascal compiler	210 K	208 K
DEBUGGER - Symbolic debugger	17 K	19 K
EDITOR§ - Text/program editor	53 K	59 K
INTERFACE - System IMPORT source	NA	45 K
LIBRARIAN§ - Object file manager	50 K	55 K
REVASM§ - Reverse assembler	18 K	21 K
Utilities		
ETU - EPROM Transfer Utility	20 K	22 K
FILER - File manager	60 K	57 K
MEDIAINIT - Disc/tape formatter	35 K	35 K
TAPEBKUP - CS/80 tape backup	20 K	18 K
Sample code		
DOC - Source code files		448 K

Pascal Utility and Applications Planning Information

Complete ordering information is provided for each product in **Appendix** A. The RAM requirement for each application is for the application *plus* the Pascal system.

Description	Pascal System Required	Software Part Number or Product Number	Bytes RAM	Disc Space
Compiled Subprogram Utilities for BASIC 4.0	3.1	98613-11x40	640 K	195 K
Programmable Datacomm Interface (PDI) Development Package	2.0 - 3.1	98690A	---	20 K

Once developed, it is possible for a Pascal application to execute in a system which has no keyboard or CRT. The disc drive may also be omitted if the application uses 98255A EPROM or 98259A Bubble Memory as its mass-storage device.

§ The RAM figure for these programs are affected by the size of the source or object file being processed.

Software Media Options

Software Product Option	Software Part Number Digit 09800-NNxNN	Description
022	NA	88140 ¼-in. Data Cartridge (multi-user if HP-UX software)
042 or 655	-NN6NN	5-¼-in. Flexible Disc, internal (Series 200) interleave
043 or 650	-NN5NN	5-¼-in. Flexible Disc, external (9125S) interleave
044 or 630	-NN3NN	3-½-in. Flexible Disc (single-sided format)
045 or 632	-NN4NN	3-½-in. Flexible Disc (double-sided format)
085	NA	9153A winchester disc drive (software pre-installed)

All operating systems (including ROM-based systems), utilities and applications include programs and data which are supplied on magnetic media. You must specify the medium on which you want your software delivered. There are two ways to do this depending on whether the software is sold by a 5 or 6-character *product number* (such as 98615C) or by a 10-digit *part number* (such as 98613-11340).

Product-Numbered Software
Product-numbered software is ordered by a 5-digit product number having a 1 or 2-letter suffix such as: 98613C or 92244GA. Unless the software is only supplied on a single media type, you must designate the media desired via an Option number. The Options available may include the following:

- **Option 022** provides the software on an HP88140-format ¼-in. tape cartridge compatible with the following: 7908P/R, 7911P/R, 7912P/R, 7914P/R, 7914CT, 7914ST Option 002/240, 7914TD Option 002/240, 7942A, 7946A and 9144A.
- **Option 042** provides the software on 5¼-in. flexible discs which have been formatted with an interleave which optimizes them for use in the 9130K/31G internal disc drives of the Series 200 Model 226 and 236. If Option 042 is not available, specify Option 043 or 650. Option 043 discs are also useable in internal discs, but with slower disc I/O performance.
  Option 655 is an older designation for Option 042
- **Option 043** provides the software on 5¼-in. flexible discs which have been formatted with an interleave which optimizes them for use in the HP82901/02M/S, HP9125S and HP9135A external disc drives. If Option 043 is not available, specify Option 042 or 655. Option 042 discs are useable in external discs, but with slower disc I/O performance.
  Option 650 is an older designation for Option 043
- **Option 044** provides the software on 3½-in. micro flexible discs, formatted single-sided (The actual media may be double-sided). These discs are suitable for use in the following drives: HP9121D/S*, 9122D/S, 9133A/B, 9133D/H, 9133V/XV, 9153A. If you have both 3½-in. and 5¼-in. discs, Option 044 is recommended.
  Option 630 is an older designation for Option 044.
- **Option 045** provides the software on 3½-in. double-sided micro flexible discs, (formatted double-sided). These discs are suitable for use in the following drives: HP9122D/S, 9133D/H, 9153A.
  Option 632 is an older designation for Option 045.

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* Double-sided 3½-in. flexible discs are not mechanically compatible with early non auto-shutter 9121D/S and 9133A drives. See 9121 in **AppendixA** for upgrade information.

- **Option 085** provides the software pre-installed on a 9153A disc (presently offered only on 98305A HP EGS). Other software for the same system, and software support services should specify Option 045.

Media for Part-Numbered Software
Part-numbered software is ordered by a 10-digit part number such as: 98613-10340. For such software, the eighth digit represents the media type. In this Guide, this digit is always shown as an "x" character (unless there is no choice of media).

The "x" represents a digit which you must specify to denote the medium. This digit may be one of "3", "5" or "6". The choices are shown beside the part number in braces such as: {3, 5, 6}. Not all digits are available for all software.

These digits denote the following media:

3 - for example 98613-10340, which provides software on the same 3½-in. discs as Option 044;

4 - for example 98613-10440, which provides the software on the same 3½-in. discs as Option 045; (If "4" is not shown in the braces, choose "3".)

5 - for example 98613-10540, which provides the software on the same 5¼-in. discs as Option 043; (If "5" is not shown in the braces, choose "6".)

6 - for example 98613-10640, which provides the software on the same 5¼-in. discs as Option 042; (If "6" is not shown in the braces, choose "5".)

Multiple Copy Discounts on Software

If you have or are purchasing multiple systems, you may be eligible for discounts on multiple copies of certain software packages.

To be eligible, you must have already purchased from HP, or be concurrently purchasing from HP, the full-price "A/B/C"-suffix version of the same software product, for example 98305_ HP-EGS. "A/B/C"-products included in bundled systems (such as the 98613B BASIC system included with the 98580A) qualify for this discount. HP software products bundled into systems purchased from HP OEM's do not qualify for the discount.

Each additional copy of the software is purchased at a discount in one of two ways:

1. Order the same software product number but with an "R" suffix (such as 98305R). The "R" product confers the right to reproduce the "A/B" software for use on one other computer, and includes a set of manuals. The "R" product also confers the right to resell or sublicense the software in the normal course of your business.
2. Order the same software product number but with an "M" suffix (such as 98305M). The "M" product confers the right to reproduce the "A/B" software for use on one other computer, and includes a set of manuals. The "M" product does not confer the right to resell or sublicense the software in the normal course of your business. Most Series 300 software is not available with the "M" option.

Note - Not all of these methods are offered with all available software. Purchase of an "M" or "R" product is not required for multiple use of the software on the *same computer*. For example, you need purchase only one copy of the 98693A/M/R software for a use on a single computer, regardless of how many SRM cards are installed in that computer.

System Packaging

Chapter 3

The Series 300 is available in several configurations, all based on the same 325mm-wide System Processor Unit (SPU) modular enclosure. The **HP 9000 Series 300 Hardware Technical Data** book *(HP Pub. No. 5953-9572)* contains specifications, operating requirements and characteristics for Series 300 systems.

The following table provides an overview of the major considerations in the selection of the computer mainframe. There are bundled systems available which include additional hardware and may include software.

All models include a built-in HP-IB (with 1m cable), RS-232C and HP-HIL interface (with 0.8-3.0m cable), a battery-backed real-time clock and audio output. All Series 300 SPUs, when properly configured, can execute the BASIC, HP-UX or Pascal operating systems.

Series 300 System Packaging Selection Guide

Model	Order Number	Description	Features
310	98561A	Base System	10 MHz MC68010, 1.0 Mbytes RAM, 512×400×1 monochromatic video output
	98580A	Medium Resolution Monochromatic Bundle	Base 310 plus monochromatic monitor, keyboard and BASIC 4.0
	98581A	Medium Resolution Color Bundle	Base 310 plus color monitor and keyboard
320	98561B	Base System	16 MHz MC68020 plus MC68881 floating point co-processor, 1.0 Mbytes RAM
	98582A	High Resolution Monochromatic Bundle	Base 320 plus 17-in. 1024×768 mono-chromatic monitor and keyboard, 2.0 Mbytes RAM
	98583A	High Resolution Color Bundle	Base 320 plus 1024×768×4 color video and 19-in. monitor, 8-slot HP-DIO expander, disc interface, DMA and keyboard, 2.0 Mbytes RAM

All Series 300 computer mainframes use the HP-DIO (Direct I/O) backplane. There are four "accessory" card slots (two of which are "I/O" card slots) and two "system" board slots. A 98658A/T expander adds eight accessory (4 I/O) slots. A 9888A expander adds 16 accessory (8 I/O) slots; however, there are restrictions on the use of the 9888A with the Series 300.

"Accessory" slots accept any HP-DIO card having a 100-pin edge connector and no cover plate. Most non-I/O cards (such as RAM, DMA, EPROM, etc.) are this type.

"I/O Slot" refers to the lower of each pair of accessory backplane slots in a Series 300 computer or Bus Expander. Of each slot pair, only the I/O slot accepts a card having a cover plate and thumbscrews. Most (but not all) I/O cards have a cover plate and must be installed in an "I/O slot". Whether or not a card has a cover plate is listed in **Appendix A** in the discussion of the card.

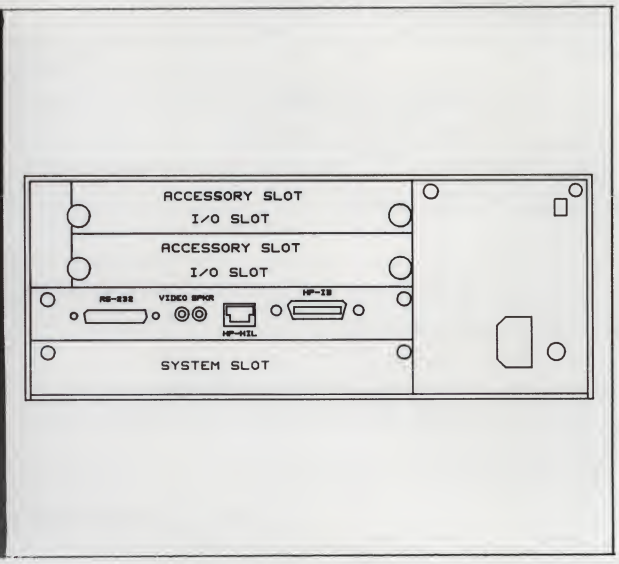
"System" slots accept (wider and deeper) boards having a 96-pin pin-and-socket connector. Only processor and bit-mapped video boards are this type.

There are presently no power considerations with all possible combinations of supported system, accessory and I/O cards.

Model 310 Features and Options



Front View: 98580A Bundled System



Rear View: 98561A Base System

The table on the following page summarizes the features of the 98561A base system and the two bundled systems: 98580A - a medium resolution monochromatic configuration including BASIC; and 98581A - a medium resolution color configuration.

Model 310 System Descriptions

98561A Model 310 base system includes:

- Series 300 modular enclosure with power supply, installation manual
- 98561-66512 processor board with 10 MHz MC68010 CPU, 1.0 Mbytes RAM, HP-IB (with 1.0m cable), RS-232C, HP-HIL (with 0.8-3.0m cable), 512×400×1 monchromatic video[§] output (w 2.4m video and audio cables) and battery-backed Real-Time clock.
- 98242A 4-slot HP-DIO backplane

98561A Option 002 deletes:

- 512 Kbytes of RAM, by substituting a 98561-66511 processor board. The system is otherwise identical to the standard 98561A. *Do not* specify *both* Option 002 and 003.

98561A Option 003 deletes:

- the built-in 512×400×1 monochromatic video, by substituting a 98561-66513 processor board. The system is otherwise identical to the standard 98561A. If bit-mapped video is required, you need to separately order one of the 9854x-series video boards. *Do not* specify *both* Option 002 and 003.

98561A Option 004 deletes:

- the four-slot HP-DIO backplane. This option is for applications where the built-in video, RAM, HP-IB, RS-232C and HP-HIL are sufficient. You may restore the four-slot backplane later by ordering a 98242A upgrade kit. The HP-DIO backplane must be present in order to use a 98568A/T Series 300 bus expander.

§ The built-in video may be disabled if you later choose to use a plug-in 98540-series bit-mapped video interface board.

98580A medium resolution monochromatic bundled system includes:

- 98561A Model 310 base computer
- 35731 12-in. monochromatic monitor
- 46020-series HP-HIL keyboard (depending on localized version of system specified)
- 98613B BASIC 4.0 Language System on 3½-in. single-sided flexible discs

98580A Option 002 deletes:

- 512 Kbytes of RAM, by substituting a 98561-66511 processor board (same as 98561A Option 002)

98580A Option 008 adds:

- a 98546A video compatibility interface (with 0.2m and 2.4m video cables). This interface provides 512×390×1 video with separate alpha and graphics planes. It is functionally identical to the Model 217 video interface (98204B). It consumes one HP-DIO accessory slot and one I/O slot. You may use this interface solely, or in conjunction with Series 300 bit-mapped video (with high-res., a separate monitor is required). Refer to the 98546A section of **Appendix A** for a discussion of considerations.

98581A medium resolution color bundled system includes:

- 98561A Option 003 Model 310 computer without built-in video interface
- 98543A 512×400×4 color video system card (with 2.4m cables)
- 35741 12-in. color monitor
- 46020-series HP-HIL keyboard (depending on localized version of system specified)

98581A Option 008 adds:

- a 98546A video compatibility interface and cable as in the 98580A system. This interface connects to the green video input of the 35741 monitor.

Model 310 Feature Guide

Feature - Description	98561A	98580A	98581A
Processor type and clock rate (MHz)	68010, 10	68010, 10	68010, 10
Memory management unit (MMU)	Standard	Standard	Standard
Internal RAM (on processor board), bytes	1.0 M	1.0 M	1.0 M
reduce RAM to 512 Kbytes	Option 002	Option 002	NA
Maximum RAM (without expander), bytes	5.0 M	5.0 M	5.0 M
Maximum RAM with any expander, bytes	7.5 M	7.5 M	7.5 M
Earliest BASIC Language System supported	4.0	4.0	4.0
Earliest HP-UX Operating System supported	5.0	5.0	5.0
Earliest Pascal Language System supported	3.1	3.1	3.1
Operating System supplied	None	BASIC 4.0	None
512×400×1 video output on CPU board	Standard	Standard	None
Delete video output on CPU board	Option 003	NA	NA
98542A§ 512×400×1 video output	Available	Available	Available
98543A§ 512×400×4 color video output	Available	Available	Standard
98544A§ 1024×768×1 video output	Available	Available	Available
98545A§ 1024×768×4 color video output	Available	Available	Available
98546A§ 512×390×1 video compatibility	Available	Option 008	Option 008
Video monitor included (standard)	None	35731 (12-in.)	35741 (12-in.)
Alpha resolution (lines×columns)	26×80	26×80	26×80
Display enhancements - underline, inverse video	Standard	Standard	Standard

§ These products numbers are provided for reference. If the feature is not "Standard" or an "Option", order the product number shown.

Feature - Description	98561A	98580A	98581A
Built-in HP-IB interface and 1m cable	Standard	Standard	Standard
Built-in RS-232C interface (no cable)	Standard	Standard	Standard
HP-DIO slots available (total, I/O)	4, 2	4, 2	4, 2
with Option 008	NA	2, 1	2, 1
delete HP-DIO backplane	Option 004	NA	NA
Maximum HP-DIO slots with 98568A/T expander	12, 6	12, 6	12, 6
Maximum HP-DIO slots with 9888A expander(s)	34, 16	34, 16	34, 16
Maximum HP-DIO slots with all expanders	42, 20	42, 20	42, 20
Built-in HP-HIL Human Interface Link & cable	Standard	Standard	Standard
Localized power/cord, keyboard†, documentation			
(98561A does not include keyboard or monitor)			
(46020AW)§ Belgian/Flemish	98561A	98580AW	98581AW
(46020AY)§ Danish	98561A	98580AY	98581AY
(46020AH)§ Dutch	98561A	98580AH	98581AH
(46020AL)§ English, Canadian	98561A	98580AL	98581AL
(46020A)§ English, Universal	98561A	98580AK	98581AK
(46020AU)§ English, U.K.	98561A	98580AU	98581AU
(46020A)§ English, US ASCII	98561A	98580A	98581A
(46020AX)§ Finnish	98561A	98580AX	98581AX
(46020AF)§ French	98561AF	98580AF	98581AF
(46020AC)§ French, Canadian	98561AF	98580AC	98581AC
(46020AQ)§ French, Swiss	98561AF	98580AQ	98581AQ
(46020AD)§ German	98561AD	98580AD	98581AD
(46020AP)§ German, Swiss	98561AD	98580AP	98581AP
(46020AZ)§ Italian	98561AZ	98580AZ	98581AZ
(46020AJ)§ Katakana	98561AJ	98580AJ	98581AJ
(46020AN)§ Norwegian	98561A	98580AN	98581AN
(46020AE)§ Spanish, European	98561AE	98580AE	98581AE
(46020AM)§ Spanish, Latin	98561AE	98580AM	98581AM
(46020AS)§ Swedish	98561A	98580AS	98581AS
Boot loader ROM version	Rev. A	Rev. A	Rev. A
SRM Workstation compatibility	Available	Available	Available
SRM Controller compatibility	NA	NA	NA
Convert warranty from 1-year return-to-HP to 90-days on-site.	Option W03	Option W03	Option W03

§ These product numbers are provided for reference. If the feature is not "Standard" or an "Option", order the product number shown.

† The 98561A base system does not include a keyboard. A system without a keyboard does not meet the minimum requirements for service support by HP personnel.

The following table shows the *cumulative* effect of Options.

Model 310 Backplane Available Slot Data

Product and Options	Description	System Slots	HP-DIO Slots Available	
			Total	I/O
98561A	Base Model 310 computer	1	4	2
98561A Option 004	Delete HP-DIO backplane	1	0	0
98580A	Monochromatic bundled system	1	4	2
98580A Option 008	Add video compatibility	1	2	1
98581A	Color bundled system	0	4	2
98581A Option 008	Add video compatibility	0	2	1

Model 310 Considerations

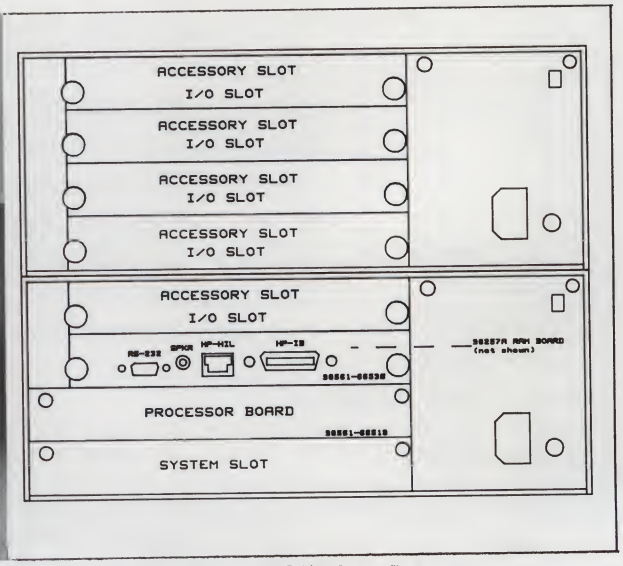
Complete support information is provided in **Appendix A** under 98561, 98561-66511, 98561-66512 and 98561-66513.

- 98561A Option 003 is suggested for systems which require a color or high-resolution video interface such as the 98543A, 98544A, 98545A or 98700H Option 030. 98561A Option 003 is also suitable for HP-UX systems which will use a terminal as system console; however, a graphics terminal is generally more expensive and slower than the built-in display/keyboard.
- The Model 310 supports a *single* 98568A/T Series 300 bus expander.
- HP-IB cabling rules and the characteristics of the built-in HP-IB interface are the same as the 98561-66530 interface described in **Appendix A.**
- HP-HIL (HP Human Interface Link) cabling rules and the characteristics of the built-in HP-HIL interface are the same as the 98561-66530 interface described in **Appendix A.**
- RS-232C cabling and the characteristics of the Model 310 built-in RS-232C interface are the same as the 98644A interface described in **Appendix A.**
- Monochromatic video cabling for the built-in 512×400×1 interface is the same as the 98542A medium resolution video system card described in **Appendix A.**
- Color video cabling for the 98543A medium resolution color video system card (supplied in the 98581A bundle) is described in **Appendix A.**
- Refer to 98243A in **Appendix A** for a discussion of Model 310 to 320 upgrades.
- You can add *HP Touch* capability to either 12-in. CRT monitor with the 35723A HP-HIL touchscreen bezel. Refer to **Appendix A.**
- 19-in. EIA rack mount adaptors are available for Series 300 computers and 12-in. CRT monitors. Refer to 98561 and 35731/41, respectively, in **Appendix A.**

Model 320 Features and Options



Front View: 98561A Base System



Rear View: 98561B Base System, plus 98568A Expander

The table on the following page summarizes the features of the 98561B base system and the two bundled systems: 98582A - a high-resolution monochromatic video configuration; and 98583A - a a high-resolution four-plane color configuration with HP-DIO expander, DMA and high-speed disc interface.

Model 320 System Descriptions

98561B Model 320 base system includes:

- Series 300 modular enclosure with power supply, installation manual
- 98561-66519 processor board with 16 MHz MC68020 CPU, MC68881 floating point co-processor and 16 Kbytes high-speed cache RAM.
- 98561-66530 human interface card which provides: HP-IB (with 1.0m cable), RS-232C, battery-backed real-time clock, HP-HIL (with 0.8-3.0m coiled cable) and audio output (audio cable included with specified video board).
- 1.0 Mbyte RAM (one 98257A card)
- 98242A 4-slot HP-DIO backplane

98582A high-resolution monochromatic bundled system includes:

- 98561B Model 320 base computer
- 2.0 Mbytes RAM (one additional 98257A 1.0 Mbyte RAM card)
- 98544A 1024×768×1 high-resolution video system board, 3m video cable and 2.4m audio cable (with adaptor)
- 98781A 17-in. monochromatic monitor
- 46020-series HP-HIL keyboard (depending on localized version of system specified)

98583A high-resolution color bundled system includes:

- 98561B Model 320 base computer
- 2.0 Mbytes RAM (one additional 98257A 1.0 Mbyte RAM card)
- 98545A 1024×768×4 color video system card, 3m video cables and 2.4m audio cable
- 98782A 19-in. color monitor
- 98658T Series 300 8-slot HP-DIO bus expander (includes 98625A high-speed disc interface and 98620B DMA card)
- 46020-series HP-HIL keyboard (depending on localized version of system specified) and 46081A 2.4m HP-HIL expander with audio

Model 320 Feature Guide

Feature - Description	98561B	98582A	98583A
Processor type and clock rate (MHz)	68020, 16	68020, 16	68020, 16
Memory management unit (MMU)	Standard	Standard	Standard
Internal RAM (on processor board), bytes	16 K cache	16 K cache	16 K cache
RAM supplied (98257A 1.0 Mbyte cards)	1.0 M	2.0 M	2.0 M
Maximum RAM (without addn'l expander), bytes	3.0 M	3.0 M	7.5 M
Maximum RAM with any expander, bytes	7.5 M	7.5 M	7.5 M
Earliest BASIC Language System supported	4.0	4.0	4.0
Earliest HP-UX Operating System supported	5.0	5.0	5.0
Earliest Pascal Language System supported	3.1	3.1	3.1
Operating System supplied	None	None	None
Video output on CPU board	None	None	None
98542A[§] 512×400×1 video board	Available	Available	Available
98543A[§] 512×400×4 color video board	Available	Available	Available
98544A[§] 1024×768×1 video board	Available	Standard	Available
98545A[§] 1024×768×4 color video board	Available	Available	Standard
98546A video compatibility interface	Available	Available	Available
Video monitor included	None	98781A (17-in.)	98782A (19-in.)
CRT Display alpha resolution (lines×columns)	NA	48×128	48×128
Display enhancements - underline, inverse video	Available	Standard	Standard
Built-in HP-IB interface and 1m cable	Standard	Standard	Standard
Built-in RS-232C interface (no cable)	Standard	Standard	Standard
HP-DIO slots available (total, I/O)	2, 1	1, 1	7, 4
delete HP-DIO backplane	NA	NA	NA
Maximum HP-DIO slots with 98568A/T expander	11, 5	11, 5	15, 8
98658T[§] bundled bus expander	Available	Available	Standard
Maximum HP-DIO slots with 9888A expander(s)	17, 8	16, 8	35, 18
Maximum HP-DIO slots with all expander(s)	37, 19	36, 19	35, 18

§ These products numbers are provided for reference. If the feature is not "Standard" or an "Option", order the product number shown.

Model 320 Feature Guide, continued....

Feature - Description	98561B	98582A	98583A
Built-in HP-HIL Human Interface Link & cable	Standard	Standard	Standard
Localized power/cord, keyboard†, documentation (98561B does not include keyboard or monitor)			
(46020AW)§ Belgian/Flemish	98561B	98582AW	98583AW
(46020AY)§ Danish	98561B	98582AY	98583AY
(46020AH)§ Dutch	98561B	98582AH	98583AH
(46020AL)§ English, Canadian	98561B	98582AL	98583AL
(46020A)§ English, Universal	98561B	98582AK	98583AK
(46020AU)§ English, U.K.	98561B	98582AU	98583AU
(46020A)§ English, US ASCII	98561B	98582A	98583A
(46020AX)§ Finnish	98561B	98582AX	98583AX
(46020AF)§ French	98561BF	98582AF	98583AF
(46020AC)§ French, Canadian	98561BF	98582AC	98583AC
(46020AQ)§ French, Swiss	98561BF	98582AQ	98583AQ
(46020AD)§ German	98561BD	98582AD	98583AD
(46020AP)§ German, Swiss	98561BD	98582AP	98583AP
(46020AZ)§ Italian	98561BZ	98582AZ	98583AZ
(46020AJ)§ Katakana	98561BJ	98582AJ	98583AJ
(46020AN)§ Norwegian	98561B	98582AN	98583AN
(46020AE)§ Spanish, European	98561BE	98582AE	98583AE
(46020AM)§ Spanish, Latin	98561BE	98582AM	98583AM
(46020AS)§ Swedish	98561B	98582AS	98583AS
Boot loader ROM version	Rev. A	Rev. A	Rev. A
SRM Workstation compatibility	Available	Available	Available
SRM Controller compatibility	NA	NA	NA
Change warranty from 1-year return-to-HP to 90-days on-site	Option W03	Option W03	Option W03

Model 320 Backplane Available Slot Data

Product and Options	Description	System Slots	HP-DIO Slots Available	
			Total	I/O
98561B	Base Model 320 computer	1	2	1
98582A	Monochromatic bundled system	0	1	1
98583A	Color bundled system	0	7	4

Model 320 Considerations

Complete support information is provided in the 98561, 98561-66519 and 98561-66530 sections of **Appendix A.**

- The Model 320 supports one 98568A/T bus expander.
- HP-IB cabling rules and the characteristics of the built-in HP-IB interface are described in **Appendix A** under 98561-66530.
- HP-HIL (HP Human Interface Link) cabling rules and the characteristics of the built-in HP-HIL interface are described in **Appendix A** under 98561-66530.

† The 98561B base system does not include a keyboard. A system without a keyboard does not meet the minimum requirements for service support by HP personnel.

- RS-232C cabling and the characteristics of the Model 320 built-in RS-232C interface are described in **Appendix A** under 98561-66530.
- Monochromatic video cabling for the 98544A system card (supplied in the 98582A bundle) is described in **Appendix A.**
- Color video cabling for the 98545A high resolution color video interface (supplied in the 98583A bundle) is described in **Appendix A.**
- An 19-in. EIA rack mount adaptor is available for the Model 320. Refer to 98561 in **Appendix A.**

Interface and Peripheral Selection

Chapter 4

Use this section to select the optional hardware products for use with your system. For each device, use **Appendix A** to specify exact ordering information, interfacing and cabling.

Not all peripherals are supported on all Series 300 mainframes and operating systems. Refer to **Appendix A** for support information. With respect to peripheral options, in general:

- all mechanical options (such as stands and covers) are supported;
- features which are programmed by HP-IB secondary commands, control characters or escape sequences in the output data may not be transparently supported, but are accessible from your programs;
- alternate interface options (such as RS-232C on an HP-IB device) are not supported. Unlisted interface options (such as Centronics or Dataproducts parallel) do not work.

Series 300 Interface and Accessory Cards

Peripherals and other add-on hardware devices do not generally include the computer interface card. If the built-in HP-IB, RS-232C and HP-HIL interfaces of the Series 300 computer you have selected are not sufficient, you will need to specify one or more additional I/O or accessory cards.

Series 300 System, Interface and Plug-in Accessory Summary

Product or Part Number	Card Style	Description	Default Select Code
50961A Option 200	I/O	SRM coax interface For use with Series 200 or 300 (required)	21
98243A	System I/O	Model 320 CPU board upgrade kit, includes... 98561-66530 interface card	NA 7, 9
98253A 98255A	Accessory Accessory	Erasable Programmable Read-Only Memory (EPROM) development kit - includes EPROM programmer interface EPROM memory card	 27 NA
98256A 98257A	Accessory Accessory	256 Kbyte RAM card 1.0 Mbyte RAM card	NA NA
98259A	Accessory	128 Kbyte bubble memory card	30
98287A	I/O	98700H Display Station interface	25 & 31
98542A 98543A 98544A 98545A 98546A	System System System System I/O + Accessory	512×400×1 monchromatic video output 512×400×4 color video output 1024×768×1 monchromatic video output 1024×768×4 color video output 512×390×1 video compatibility i/f	NA NA NA NA NA
98561-66511 98561-66512 98561-66513	System System System	98561-66512 minus 512 Kbytes RAM 68010/HP-HIL/HP-IB/RS-232/Video 98561-66512 minus video	7, 9 7, 9 7, 9
98561-66519 98561-66530	System I/O	68020 CPU board Model 320 HP-IB, HP-HIL, RS-232, clock and audio interface	NA 7, 9

System, Interface and Accessory Card Summary, continued...

Product or Part Number	Card Style	Description	Default Select Code
98603A	Accessory	ROM-based BASIC 4.0	NA
98620B	Accessory	Direct memory access (DMA) controller card	NA
98622A Option 001 Option 002 Option 003 Option 004	I/O	General Purpose I/O (GPIO) interface Adds unterminated cable Adds 9885M* cable Adds 6940B* cable Adds 9866B* cable	12
98623A Option 001	I/O	Binary coded decimal (BCD, 43 line) interface Provides unterminated cable	11
98624A 98625A	I/O I/O	HP-IB interface (standard speed) Disc interface (high speed HP-IB)	8 14
98626A Option 001 Option 002	I/O	RS-232C serial interface Adds DTE (male, modem) cable Adds DCE (female, direct-connect) cable	9
98627A	I/O	576×455×4 color video output interface (graphics only)	28 & 29
98628A Option 001 Option 002 Option 003	I/O	Datacomm interface Adds DTE (male, modem) RS-232 cable Adds DCE (female, direct-cnct) RS-232 cable Adds DCE (female, direct-cnct) RS-449/423 cable	20
98629A	I/O	Resource management (SRM) interface (*See also 50961A Option 200*)	21
98630-66502 98630A Option 001	NA I/O	service extender card Breadboard interface Adds 98630-66502 service extender card	NA 15 or 16
98633A	I/O	6944A Multiprogrammer interface	29
98635A	Accessory	Floating point math board	NA
98640A Option 001 Option 016 Option 630 Option 655	I/O	7-channel analog input interface (includes diagnostic software, but requires 98645A BASIC/Pascal software) Delete diagnostic software and 98640-67950 test hood Shield for use with Model 216 Diagnostic software on single-sided 3½-in disc. Diagnostic software on 5¼-in disc.	18
98642A	I/O	4-channel RS-232C multiplexer interface, provides one modem- compatible port and three direct-connect ports (HP-UX only)	13
98643A Option 241	I/O	Local Area Network (LAN) IEEE-802.3 interface (requires 50951/52A LAN/9000 software) Delete 28641A ThinMAU and BNC Tee	21
98644A	I/O	RS-232 serial interface	9

* These peripherals have not been tested with Series 300 computers and are not planned for support.

System, Interface and Accessory Card Summary, continued...

Product or Part Number	Card Type	Description	Default Select Code
98691A Option 001 Option 002 Option 003	I/O	Programmable datacomm interface Adds DTE (male, modem) RS-232 cable Adds DCE (female, direct-connect) RS-232 cable Adds DTE (male) RS-449 cable *Note - the 98690A PDI Development Package includes one 09826-66544 service extender, loop-back connectors, firmware guide and software examples. Does not include 98691A interface.*	20

The previous table is a summary of the available Series 300 system cards and HP-DIO (Direct I/O) interfaces and interface subsystems. Support and configuration rules and cabling information are covered in **Appendix A.**

Power limitations - (none) - All Series 300 computers and extenders have sufficient power available for all supported combinations of interface cards and plug-in accessories.

Series 300 *system* cards may be used only in one of the two system slots of the Model 310 or 320 mainframe.

Any I/O or accessory card may be used in the computer mainframe or 98658A/T Series 300 bus expander. Not all cards may be used in the 9888A Series 200 bus extender and a small performance penalty is incurred on some accessory cards when they are installed in the 9888A expander. See the 9888A discussion in **Appendix A.**

Select Code - This term denotes one or more card addresses in the range 0 thru 31. A select code is normally set by switches on the card.

Choosing an HP-IB Interface
All Series 300 computers include a "built-in" HP-IB interface. You may want one or more additional interfaces. Some peripherals require a dedicated interface, and others may be incompatible with the 98625A. The following table summarizes the factors. More detail is supplied in **Appendix A.** The built-in interface is described under 98561-66512 and 98561-66530.

HP-IB Interface	Overhead Per Transaction	Maximum Data Rate	Maximum Cards/System	Typical Uses
Built-in	5 ms	DMA: 300 Kbytes/sec no DMA: 50 Kbytes/sec	1	Normal-speed discs, cartridge tapes
98624A	15 ms	DMA: 300 Kbytes/sec no DMA: 50 Kbytes/sec	23*	Printers, plotters, instruments
98625A	5 ms	DMA: 1.2 Mbytes/sec no DMA: 50 Kbytes/sec	1	High-speed discs, 797x tapes

* HP-UX 5.0 is limited to _ 98624A cards.

Choosing an RS-232C interface
All Series 300 computers include a "built-in" RS-232C interface. You may want one or more additional interfaces. The unbuffered (1 byte) interfaces are not suitable for all serial input applications. The following table summarizes the factors. More detail is supplied in **Appendix A**. The built-in interface is described under 98561-66512 and 98561-66530.

RS-232C Interface	Number of Ports	Buffer Size	Modem Control	Supporting Systems
Built-in	1	1 char.	Yes	All
98626A	1	1 char.	Yes	All
98628A	1	256 char.s	Yes	All
98642A	4	128 char.s/port	1 port	HP-UX only
98644A	1	1 char.	Yes	All

Maximum RAM and I/O Cards (All systems)
The maximum RAM (with or without a bus extender) is limited to 7.5 Mbytes. The remaining address space (below 8.5 Mbytes) is reserved for memory- and bit-mapped I/O. The only I/O card currently using the space between 8.5 and 8.0 Mbytes is the 98206-66501 service test card. In a system having 7.75 or 8.0 Mbytes of RAM, one or more RAM cards would have to be removed before the test card could be installed.

The hardware architecture limit is 23 I/O cards (assuming that number of I/O slots are available). This is because only select codes 8, and 10 through 31 are available for plug-in I/O cards. Select codes 0 through 6 are not available for plug-in interfaces in BASIC and Pascal. Select codes are used for built-in HP-IB and RS-232C and cannot be disabled. You should not attempt to configure a large system without consulting with an HP Systems Engineer.

Series 300 Networking

Series 300 Networking Summary

Feature	Local Area Network (LAN)	uucp, uux, cu	2392A Emulator	Shared Resource Management (SRM)
Operating system required	HP-UX	HP-UX	Stand-alone	BASIC, HP-UX or Pascal
Network services provided	RFA, NFT, LLA	NFT, RCX, VT	VT, NFT	NFT (HP-UX), RFA (BASIC, Pascal)
Other systems on network	Series 200, 500, HP 3000	any HP-UX, most async hosts	any HP, most async hosts	Series 200, 500, HP 9835/45
Basic data rate	10 M bps	9.6 K bps	9.6 K bps	750 K bps
Maximum distance	1500 M	Unlimited	Unlimited	1000 M
Maximum nodes	1024	Unlimited	Unlimited	63
Connect method	Coax (two types)	RS-232C, X.25	RS-232C	Coax or Mux

Terms:

LAN	Local Area Network
LLA	Link-Level Access (ISO Level 2)
Mux	SRM Multiplexer (98028A)
NFT	Network File Transfer
RCX	Remote Command Execution
RFA	Remote File Access (implies NFT)
SRM	Shared Resource Management
uucp	UNIX*-to-UNIX* copy
uux	UNIX*-to-UNIX* execution
VT	Virtual Terminal

Networking Interfaces and Peripherals Summary

Product No. Options	Description	Supplied Cable(s)	Required Interface
	Local Area Networking (LAN) Products		
50951A	NS/9000 Software for Series 300 (single-user)		98643A
50952A	NS/9000 Software for Series 300 (multi-user)		98643A
Option 022	Software on ¼-in. tape cartridge		
Option 045	Software on 3-in. double-sided flex. disc		
98643A	IEEE-802.3 interface and ThinMAU	0.7m	I/O slot
Option 241	Delete 28641A ThinMAU		
28641A	ThinMAU (Medium Access Unit)	1.0m	98643A
30241A	"Backbone" thick MAU	None	98643A
92227-	ThinLAN cables/accessories (see 98643A in **Appendix A**)		
92254-	"Backbone" cables/accessories (see 98643A in **Appendix A**)		

* UNIX is a trademark of AT&T Technologies, Inc.
Ethernet is a trademark of Xerox Corp.

Networking Interfaces and Peripherals Summary, continued

Product No. Options	Description	Supplied Cable(s)	Required Interface
	Asynchronous Datacomm Interfaces		
98561-66511	Model 310 built-in serial interface	None	System slot
98561-66512	Model 310 built-in serial interface	None	System slot
98561-66513	Model 310 built-in serial interface	None	System slot
98561-66530	Model 320 built-in serial interface	None	I/O slot
98626A	RS-232C Serial interface	Optional	I/O slot
98628A	Datacomm interface	Optional	I/O slot
98642A	4-channel RS-232C multiplexer	Included	I/O slot
98644A	RS-232C Serial interface	None	I/O slot
	Asynchronous Datacomm Modems		
37212A	300/1200-baud Modem	Modular	RS-232C
92205A	Hayes *Smartmodem™ 1200* (U.S.)	Modular	RS-232C
92205C	Hayes *Smartmodem™ 1200* (Canada)	Modular	RS-232C
	X.25 Networking		
2334A	X.25 *Multi-MUX*	None	
Option 123	4-port modem-connect card	4×5m	RS-232C
	Shared Resource Management (SRM) Products		
98693A	SRM utilities for HP-UX		
Option 022	Software on ¼-in. tape cartridge		
Option 045	Software on 3-in. double-sided flex. disc		
50961A	SRM Coax interface		
Option 200	for use with Series 200/300	None	I/O slot
50961U	SRM Coax upgrade kit for 98629A		
Option 200	to use with Series 200/300	None	98629A
98629A	SRM Mux interface	None	I/O slot
98028A	SRM Mux	1.0m	98629A

NS/9000 Local Area Networking (LAN)
Network Services/9000 provides transparent remote file access between HP-UX systems. It also provides file transfer between Series 300 and other HP systems which support HP *AdvanceNet* protocol, such as the HP3000. HP9000 LAN is described in **Local Area Network - HP9000 Series 200 and 300**, a technical data sheet. *(HP Pub. No. 5953-9564)*

Link-level access capability is provided for customers who have the expertise to write inter-vendor software.

HP-UX Asynchronous Data Communications
HP-UX and most UNIX* and UNIX*-like systems can communicate using *uucp* over hardwired, leased, dialup and X.25 lines. File transfer, remote command execution (*uux*) and virtual terminal (*cu*) capabilities are provided. HP-UX electronic mail uses the *uucp* facility.

Uucp connections (except hardwired) are generally not dedicated. Systems communicate on demand. Your system can simultaneously communicate with as many systems as you have available ports (subject to single- and multi-user license limits). There is no limit to the number of systems with which your system can potentially communicate in turn.

* UNIX is a trademark of AT&T Technologies, Inc.

Any RS-232C interface is sufficient for hardwired operation, although the direct-connect ports of the 98642A Mux are not recommended*. All other connections require a modem-compatible interface and cable. An X.25 connection requires a modem port of an HP 2334A Option 123 *Multi-MUX* X.25 cluster controller.

The virtual terminal capability of *cu* makes your terminal (through your system) appear to be a terminal connected to a remote system. It also provides an ASCII file transfer capability, although without the error checking incorporated in *uucp*. *Cu* can communicate with most systems that are compatible with 7- or 8-bit asynchronous ASCII terminals. In general, *cu* works with any system with which HP terminals work (block-mode applications excepted).

HP 2392A Terminal Emulation
The 98791B terminal emulation package is a stand-alone (Pascal 3.1 execute-only based) application that makes your Series 300 computer emulate an 2392A terminal (including block mode). The emulator includes the capability to upload/download local LIF files.

Shared Resource Management (SRM)
An SRM network consists of one or more SRM *servers* connected to a maximum of 63 *workstations*. The server provides a shared hierarchical file system and spooled printer and plotter support. Workstations communicate only with servers, and vice-versa. Workstation-to-workstation and server-to-server communication is not supported.

BASIC and Pascal workstations can use a server's file system as their sole file system (including system boot). HP-UX must have a local hard disc. HP-UX, as a workstation, can transfer files to and from the server. Workstations submit data for spooling merely by printing or plotting to a file in one of the server's spool directories.

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* With a "3-wire" connection, if the calling system disconnects (e.g. calling process aborts), the called system cannot detect this and leaves the calling system logged in. This is a potentially serious security risk with *cu*.

Series 300 Discs

Series 300 Disc Summary
(for all systems, in order of increasing capacity)

Product Number	Capacity (bytes)	Cmd. Set	Vol--umes	Perf. I/Os/sec.	Transfer Rate	Media Type
9121S	270K	AMIGO	1	2	Std.	3½-in. Flex.
82902M°	270K	AMIGO	1...3*	4	Std.	5¼-in. Flex.
9125S	270-378K	SS/80	1	4	Std.	5¼-in. Flex.
9121D	270K, 270K	AMIGO	1	2	Std.	3½-in. Flex.
82901M°	270K, 270K	AMIGO	1...4*	4	Std.	5¼-in. Flex.
9122S	270-788K	SS/80	1	2	Std.	3½-in. Flex.
9122D	2×(270-788K)	SS/80	1	2	Std.	3½-in. Flex.
9895A	2×1.15M	AMIGO	1...4*	5	Std.	8-in. Flex.
9133V°	4.8M, 270K	AMIGO	1	8	Std.	Fixed, 3½-in. Flex.
Opt. 004	4×1.15M, 270K	AMIGO	4*	8	Std.	Fixed, 3½-in. Flex.
9154A	10.0M	SS/80	1,2,4,8	10	Std.	Fixed
9153A	10.0M, 270...788K	SS/80	1,2,4,8	10	Std.	Fixed, 3½-in. Flex.
9134XV°	14.5M	AMIGO	1	8	Std.	Fixed
9133XV°	14.5M, 270K	AMIGO	1	8	Std.	Fixed, 3½-in. Flex.
9134D°	14.7 or 16.6M	SS/80	1-8	11	Std.	Fixed
9133D°	14.7 or 16.6M, 270...788K	SS/80	1-8	11	Std.	Fixed, 3½-in. Flex.
7908P/R°	16.7M	CS/80	1	16	High	Fixed, ¼-in. ctg.
9134H	19.9 or 22.3M	SS/80	1-8	11	Std.	Fixed
9133H	19.9 or 22.3M, 270...788K	SS/80	1-8	11	Std.	Fixed, 3½-in. Flex.
7941A	23.8M	CS/80	1	18	Std.	Fixed
7942A	23.8M	CS/80	1	18	Std.	Fixed, ¼-in. ctg.
7911P/R	28.1M	CS/80	1	23	High	Fixed, ¼-in. ctg.
7907A	20.5M+20.5M	CS/80	2*	20	Std.	Fixed, Removable
7945A	55.5M	CS/80	1	18	Std.	Fixed
7946A	55.5M	CS/80	1	18	Std.	Fixed, ¼-in. ctg.
7912P/R	65.6M	CS/80	1	23	High	Fixed, ¼-in. ctg.
7914CT/P/R	132M	CS/80	1	23	High	Fixed, ¼-in. ctg.
7914TD°	132M	CS/80	1	23	High	Fixed, 9-track
Opt. 002	-	CS/80	-	-	-	adds ¼-in. ctg.
Opt. 114	132M	CS/80	+1	23	High	adds Fixed
Opt. 240	-	CS/80	-	-	-	adds ¼-in. ctg.
7914ST	132M	CS/80	1	23	High	Fixed, 9-track
Opt. 002	-	CS/80	-	-	-	adds ¼-in. ctg.
Opt. 114	132M	CS/80	+1	23	High	adds Fixed
Opt. 240	-	CS/80	-	-	-	adds ¼-in. ctg.
7933H	404M	CS/80	1	25	High	Fixed
7935H	404M	CS/80	1	25	High	Removable

A range of capacities indicates that the capacity depends on the formatting. Format is selected under software control for flexible discs and by a factory-installed jumper for Winchester discs.

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* On these drives, each entity is actually addressed as a separate *unit*, rather than a volume.

° Obsolete (but supported) or older (and less economical) disc listed for reference.

Discs on all Series 300 Systems

The HP-UX operating system requires a "system" disc. Pascal and RAM-based BASIC operating systems not connected to an SRM also require a "system" disc (BASIC is also available in ROM, requiring no disc). All systems support additional discs. This section assumes that you have chosen a RAM-based system, or require an add-on disc for your SRM- or ROM-based system. All supported discs use HP-IB interfacing.

All Series 300 operating systems support formatting of new media on-line. All systems support user-specified interleave and format option (e.g. sector size, single vs double sided).

High speed discs have an instantaneous transfer rate in excess of 300 Kbytes/sec and deliver their listed performance only when connected to an HP98625 interface in a system which has a 98620 DMA card. The built-in and 98624A interfaces support only *standard speed* mode. *Note* - the built-in HP-IB of Series 300 computers has less overhead than the 98624A. If you do not plan to have a 98625 interface, plan to use the built-in HP-IB for your system disc. A maximum of one 98625A is supported.

Command Set (Cmd. Set) - All Series 300 operating systems support CS/80 (Command Set '80), SS/80 (SubSet '80) and AMIGO disc command sets. Only CS/80 discs (and not all of them) presently offer high-speed mode. Only (and all) SS/80 Winchester discs presently offer switch-configurable addressable disc volumes. HP-UX supports AMIGO discs only as add-on mounted file systems.

BASIC and Pascal Disc Requirements and Support

BASIC/Pascal System Disc Summary

System Parameter	Requirement
System load (boot) disc command set	SS/80, CS/80 or AMIGO
Boot area size*	270 kbytes
Disc capacity	user determined
Performance	user determined

To use non-SRM RAM-based BASIC and Pascal Language Systems requires any supported internal or external 3½-in. or 5¼-in. flexible disc. To more conveniently use the system, an external Winchester disc (any capacity) or dual flexible discs of 788 Kbytes each is recommended.

These operating systems have no minimum disc performance constraints. For program/data file access, you may use any supported disc which has the capacity and performance your application requires. If you also intend to execute the HP-UX 5.1 system from the same disc, you will require a 9133/34D or 9133/34H SS/80 disc. These discs have configurable addressable volumes (separate logical disc drives) and support multiple file systems.

BASIC supports both standard SS/80 discs (256-byte sector size) and Option 001 SS/80 discs (1024-byte sector size). However, the TRANSFER statement does not work with Option 001 SS/80 discs, nor with 3½-in. flexible discs formatted with other than 512-byte sector sizes. You should specify Option 001 only if an HP-UX system co-resides on the disc, or you require the additional 10% storage capacity afforded by the 1024-byte sector size. The 512 bytes/sector format of SS/80 discs does not work in BASIC.

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* A disc area of at least 630 Kbytes is suggested for a typical system.

The theoretical maximum discs for BASIC is limited by HP-IB interfaces (24) times (command set limited) bus addresses (0...7), or 192 drives.

The theoretical maximum for Pascal is limited by logical units. There is a maximum of 50, of which six are typically used for non-disc devices.

HP-UX Disc Requirements and Support

HP-UX System Disc Summary

System Parameter	Single-User Requirement	2-to-6 User Requirement	7-to-16 User Requirement
System load (boot)	CS/80 or SS/80	CS/80 or SS/80	CS/80 or SS/80
Boot area size	1.0 Mbytes	1.0 Mbytes	1.0 Mbytes
Suggested Disc capacity			
AXE	10 Mbytes	NA	NA
Programming Environment	16 Mbytes	44 Mbytes	65 Mbytes
Full system	22 Mbytes	55 Mbytes	132 Mbytes
Disc performance			
Single system disc	11 I/Os/sec.	18 I/Os/sec.	23 I/Os/sec.
Multiple system discs			
virtual memory (VM)	11 I/Os/sec.	16 I/Os/sec.	18 I/Os/sec.
command execution	10 I/Os/sec.	16 I/Os/sec.	18 I/Os/sec.

HP-UX also requires either an 88140-format ¼-in. CS/80 cartridge tape drive or a double-sided 3½-in. SS/80 flexible disc drive for software installation and system backup. This drive may be built-in to the system disc (shared or separate-controller) or may be a stand-alone device. Half-in. 9-track tapes drives are supported but HP-UX software is not distributed on this medium.

Discussion of Terms

The Series 300 HP-UX operating system places several other demands on its discs which are summarized in the preceding table. In the context of this section, an "I/O" is a transfer of 1 Kbyte of data to/from a random location on the disc. SS/80 discs only deliver the performance listed in the **Disc Selection Table** when ordered with Option 001, 1024-byte sector size.

VM - When the total size of the executing processes and their data exceeds the installed RAM, process data is written to disc temporarily to make room for other processes or data. It is also possible for individual programs and data objects to exceed the installed RAM in size. These capabilities are handled by the virtual memory system. The system may have up to 8 VM discs. VM discs may be on separate or shared busses. The VM limit for code and data is 16 Mbytes per process on the Model 310 and 4 Gbytes on the Model 320 (limited in practice by the disc space available). The HP-UX 5.0 system also requires 1024 bytes of RAM per 1.0 Mbyte of VM allocated.

Commands - HP-UX commands and utilities are usually read in from disc each time they are executed. Disc performance is key to providing adequately fast response time. This figure is lower than the VM requirement and should only be used for multi-disc configurations where the 'commands' disc is not also being used for VM.

The performance figures above are minimum guidelines for a typical software development environment. Specific applications may have significantly different requirements.

Shared controller disc/tapes (such as the 7946A) are supported but not generally recommended for multi-user HP-UX. During tape operations, the disc may be inaccessible for tens of seconds or disc performance may degrade to one I/O per second or less for tens of minutes. This may be tolerable if tape formatting and backup is performed only when the system is not otherwise in use. The recommended configuration is separate drives (such as 7914CT, or 7945A plus 9144A) or separate-controller (such as 7914ST Option 002), where the tape drive is on a separate bus from the disc.

In multi-user systems and in certain single-user applications, **multiple system discs** provide an aggregate performance which exceeds each disc alone. The improvement for two similar discs is generally 1.5 or more times the I/Os/sec of one disc alone. This requires that the system and user demands be distributed between the drives.

You can gain a slight performance increase in a multi-disc system by placing the discs on separate HP-IB interfaces, but only if the interfaces are the built-in or 98625, and not the 98624A.

The theoretical maximum discs for HP-UX 5.0 is limited to 8 CS/80 and/or SS/80 drives (with up to 16 total units and any number of volumes), and 8 AMIGO drives (no units limit). HP-UX can address any number of drives simultaneously. There are considerations for HP-UX systems with large numbers of discs:

- There are only two DMA channels; only two HP-IB cards could be performing DMA data transfers simultaneously.
- Simply adding more discs does not guarantee improved system performance. You must keep them all busy to increase the total system "I/Os per second", and there is a limit to the load that the system can handle. Under normal circumstances, it is about 200 I/Os per second on a Model 320. You can improve system performance with moderate numbers of discs only if you "load balance" them.

Co-Resident Operating Systems

The BASIC and Pascal Language Systems and the stand-alone applications based on those systems can share a common directory structure (LIF), and may reside on the same disc medium. At system power-up (boot), you may select the system desired. Of course, only one system may execute at a time on the same computer.

If you initialize a Winchester (hard) disc in Pascal, and use its default of multiple "soft" volumes, you may access only the first volume from BASIC and HP-UX. If you use the switch-configured SS/80 "hard" volumes (9133/34D/H and 9153/54A only), both BASIC and Pascal can access all "hard" volumes. Pascal may still create "soft" volumes within "hard" volumes.

The HP-UX Operating System may not reside on a LIF volume. It must be located on a separate SS/80 volume or medium from any other systems. If you plan to use HP-UX and a LIF-based system on the same computer, you must have a separate SS/80 volume or mass storage device for the LIF-based systems. For data sharing, HP-UX can access a separate LIF disc via utility commands, but not via normal file system intrinsics. HP-UX can access all eight volumes of an SS/80 hard disc.

Series 300 Magnetic Tape Drives

Series 300 Magnetic Tape Summary
(in numerical order by product number)

Tape Drive or Disc/Tape Product Number	Density (cpi)	Max. Tape Capacity in Mbytes	Read While Write	Perf. in Mb/min.	Shared Controller Option	Separate Controller Option
¼-in. cartridge tape drives						
7908P/R° built-in 88140	10000	67	NA	2	Std.	NA
7911P/R built-in 88140	10000	67	NA	2	Std.	001
7912P/R built-in 88140	10000	67	NA	2	Std.	001
7914CT built-in 9144	10000	67	Std.	2	NA	Std.
7914P/R built-in 88140	10000	67	NA	2	Std.	001
7914ST optional 88140	10000	67	NA	2	240	002
7914TD° optional 88140	10000	67	NA	2	240	002
7942A built-in 9144	10000	67	Std.	2	Std.	NA
7946A built-in 9144	10000	67	Std.	2	Std.	NA
9144A stand-alone drive	10000	67	Std.	2	NA	Std.
½-in. 9-track tape drives						
7914ST built-in 7974	1600	45	Std.	8	NA	Std.
Option 800 adds	800	22	Std.	4	NA	Std.
7914TD° built-in 7971	1600	45	Std.	4	NA	Std.
7971A° Option 844 drive	1600	45	Std.	4	NA	Std.
7974A stand-alone drive	1600	45	Std.	8	NA	Std.
Option 800 adds	800	22	Std.	4	NA	Std.
7978A stand-alone drive	1600	45	Std.	8	NA	Std.
	6250	140	Std.	16	NA	Std.

Discussion of Terms
In the table, "88140" refers to the built-in tape drive of the 7908/11/12/14 discs. It cannot be ordered separately. All of the ¼-in. drives listed use the 88140 tape format.

Interface - All of the tape drives are interfaced via HP-IB. A 98620B DMA card is required for the 7971A ½-in. 9-track tape drive; and recommended for the 7974A and 7978A. A 98625 high-speed HP-IB interface is also recommended for the 7978A.

Density - the number of characters (bytes) per inch (cpi) that an be stored on the tape.

Capacity - the maximum number of bytes that can be stored on one tape. The ¼-in. figure is based on the 600-ft.tape (88140LC). The ½-in. figure is based on a 2400-ft. tape with a 16384 byte record size. The use of 3600-ft. tapes with 9-track drives is not recommended or supported.

Read-while-write - when writing to the tape, the drive itself is verifying the data (reading the written data and comparing it). To verify without read-while-write you must rewind the tape and re-read. This halves the listed performance.

Performance - The figures account for just the mag tape I/O. Normal backup operations are slower due to the time required to locate and read the files being saved.

° Obsolete (but supported) or older (and less economical) device listed for reference.

Shared Controller - The tape drive shares the disc controller electronics, HP-IB connector and HP-IB address. Disc access is deferred (slowed) while tape operations are in progress.

Separate Controller - The tape drive has its own controller electronics, HP-IB connector and HP-IB address. Disc operations are unaffected if the tape is on a separate HP-IB interface. This is the recommended configuration if you have a separate HP-IB interface for the tape drive (usually the same bus used for other non-disc devices).

Magnetic Tape Support on all Series 300 Systems
BASIC, HP-UX and Pascal support "88140-format" ¼-in. (cartridge) tapes drives. Only HP-UX supports ½-in. (open reel 9-track) tape drives. Only HP-UX offers software on ¼-in. cartridge tape media. No Series 300 systems support the HP 92242S/L *unformatted* ¼-in. tapes (used in the HP 9142A drive).

The maximum number of tape drives supported is the same as that described for discs in the preceding section, since tape drives are addressed in the same manner as discs. Cartridge tape drives are not normally treated as mounted file systems by HP-UX, and 9-track drives never are.

BASIC and Pascal Magnetic Tape Support
BASIC and Pascal are distributed only on flexible disc.

Both systems include a backup for ¼-in. tape drives which creates a disc-image of a complete LIF file system. You can also use file and volume-copy commands for backup.

BASIC and Pascal do not presently support ½-in. 9-track tape drives, although a 7974A utility is provided (only) as part of the Pascal-based HP EGS product (98305A).

HP-UX Magnetic Tape Support
HP-UX 5.0 supports ¼-in. cartridge tape drive for initial system installation (3½-in. double-sided flexible disc installation is also available with HP-UX 5.1). HP-UX software is not distributed on ½-in. 9-track tape.

Utilities are provided for file volume, selective file and incremental backups for ¼-in. tape, ½-in. tape or disc target devices.

The 7974A and 7978A use a very efficient command set, have large data buffers and a fast HP-IB bus interface circuit. They can share a bus with your system discs with minimum performance degradation (<10%). It is recommended that the 7978A be connected to the 98625 interface (if present).

Series 300 Alphanumeric Displays and Terminals

Series 300 Alphanumeric Display Summary

Monitor	Video Interface	Phosphor	Graphics Resolution	Screen Size	Alpha Resolution	Windows /9000
35721	310 built-in	P31	512×400×1	14"	26×80	Yes
	98542A	P31	512×400×1	14"	26×80	Yes
	98546A	P31	512×390×1	14"	25×80	No
35731	310 built-in	P31	512×400×1	12"	26×80	Yes
	98542A	P31	512×400×1	12"	26×80	Yes
	98546A	P31	512×390×1	12"	25×80	No
35741	98543A	P22 Color	512×400×4	12"	26×80	Yes
	98546A	Green	512×390×1	12"	25×80	No
98781A	98544A	P40	1024×768×1	17"	48×128	Yes
98782A	98545A	P22 Color	1024×768×4	19"	48×128	Yes
98782A+98700H	98287A w/Opt. 701	P22 Color	1024×768×4 1024×768×8	19"	48×128	Yes

Series 300 Terminal Summary

Product	Alpha Thruput	Phosphors Available	Graphics Resolution	Diag. Size	Alpha Res.	Features
2392A	19,200	P31	NA	12"	26×80	pp,SS
2393A	19,200	P31	512×390	12"	27×80	HP-HIL,pp,SS
2397A	19,200	P22	512×390×3	12"	27×80	HP-HIL,pp,SS
2623A	9,600	P4,P31,P134	512×390	12"	26×80	gt,ip,PP
2624B	9,600	P4,P31,P134	NA	12"	26×80	ip,PP
2625A	19,200	P4,P31,P134	512×390	12"	27×80	gt,ip,pp,SS
2627A	9,600	P22 Color	512×390×3	12"	26×80	gt,PP
2628A	19,200	P4,P31,P134	512×390	12"	27×80	gt,ip,PP,SS
45710 (HP110)	4,800	LCD	480×128*	9"	16×80	DP,IM,PC,PP
45711A	4,800	LCD	480×200*	10"	16×80	DP,IM,PC,PP
45610 (HP150)	19,200	P31	512×390	10"	26×80	DP,im,ip,PC,PP,SS
45850 (150-II)	19,200	P31	512×390	12"	26×80	HP-HIL,DP,im,PC,pp,SS
9807A	1,800	EL	512×255*	9"	24×80	HP-HIL, im, IP, PC
98700H Option 701	7,200	P22 Color	1024×768×4 1024×768×8	19-in.	48×128	
98791B	6,000	Note†	Note*†	Note†	24×80	Note†

* These terminals are not supported as graphics devices by HP-UX.

† The 98791B terminal emulator runs on all Series 300 computers and emulates the HP 2392A and VT100 terminals.

Discussion of Terms

Features - a quick summary of the major distinguishing features of the terminals. If the feature is uppercase, it is standard; lowercase, it is optional.

DP	Dual Port - can connect to two hosts	GT	17623A Graphics Tablet supported
HP-HIL	HP-HIL input devices are supported	IM	An Internal Modem is available
IP	An Internal Printer is available	PC	Terminal is also a Personal Computer
PP	Printer Port is available	SS	Has Smooth Scrolling capability

The **phosphors** are:

EL	-	Electroluminescent (black on amber)
LCD	-	Liquid Crystal (black on white)
P4	-	White
EBU, P22	-	Full color
P31	-	Green
P134	-	Amber

Alpha Resolution - listed in lines×columns. Terminals with more than 24 lines use the additional lines for softkey labels and/or terminal status messages. All terminals (except the HP 110) display characters at an effective resolution of 8×14 or better (7×11 with half-dot shifting).

Character sets - Although not listed in the tables, all of the Series 300 displays support the HP ROMAN8 and KANA8 character sets. All of the terminals support either ROMAN8 or the older Roman Extension subset. More information on this topic follows the HP-UX discussion below.

Series 300 System Consoles

The Series 300 operating systems normally require a *system console*. On all models, this function may be served by the built-in keyboard and alpha display. In HP-UX you may substitute a terminal. Only the HP-UX operating system fully supports terminals. Debugged applications can execute on a system with no keyboard or displays (although the keyboard interface must be present in BASIC and HP-UX).

BASIC Console

There may be only (zero or) one alpha console in BASIC. The default alpha console is the first found of:

- "Internal" bit-mapped display (if interface present and CRTB binary loaded). This may be a Model 310 built-in, 98542/43/44/45A board or 98700H display station (if the 98287A is configured for "internal" control space.
- 98546A compatibility video interface (if interface present and CRTA binary loaded).
- 98700H display station with its 98287A interface configured for "external" (select code based) control space. If two are present, the one with the lowest select code is used. The CRTB binary must be loaded.

The default graphics "CRT" device is the same as the alpha device if the alpha display has graphics capability. If the alpha display is the 98546A with its graphics card removed, the default graphics is chosen as above. If none of the above are present, the 98627A card at the lowest select code is chosen.

Output is possible to only one display at a time. The alpha contents of the prior alpha display is always lost when switching. Display color maps are always reset to their defaults when switching graphics displays (with PLOTTER IS), and the next display is erased if a GINIT has been performed since the next display was last addressed. BASIC can switch between the default bit-mapped display and the 98546A interface with a CONTROL statement. The 98627A is never used as an alpha display.

The maximum number of graphics displays in BASIC is: two bit-mapped (only one of which may be a 98542/43/44/45A or Model 310 built-in), plus one compatibility, plus several 98627As (limited by available select codes).

HP-UX Console
There must be one alpha console in HP-UX and there may be additional terminals. The default alpha console is the first found of:

- A built-in, 98626A, 98628A, 98642A or 98644A RS-232C serial interface with the "remote" switch/jumper on/installed. If more than one is present, the one with the lowest select code is used. In the case of the 98642A mux, port 1 is used.
- "Internal" bit-mapped display (if present). This may be a Model 310 built-in, 98542/43/44/45A board or 98700H display station (if the 98287A is configured for "internal" control space). "External" 98700H stations are never chosen.
- 98546A compatibility video interface (if present).
- A built-in, 98626A, 98628A, 98642A or 98644A RS-232C serial interface with the "remote" switch/jumper off/ not installed. If more than one is present, the one with the lowest select code is used. In the case of the 98642A mux, port 1 is used.

There is no supported method for enabling an ignored 98546A as an alpha device. Both *Starbase* and DGL may address any installed graphics display. Windows/9000 can address an ignored bit-mapped display.

The maximum number of graphics displays in HP-UX is: two bit-mapped (only one of which may be a 98542/43/44/45A or Model 310 built-in), plus one compatibility, plus several 98627As (limited by available select codes), plus several graphics terminals (limited by RS-232C ports and licensed user limit).

Pascal Console
There may be only (zero or) one alpha console in Pascal. The console is chosen according to the ordering of the display modules in "INIT_LIB" (user specified). There is no supported method for switching alpha displays after system start-up. "External" 98700H display stations are never chosen. The use of the 98627A as an alpha display is not supported by HP.

Graphics output is possible to only one display at a time. Display color maps are always reset to their defaults when switching graphics displays, but the next display contents are preserved if the DISPLAY_INIT has control bit 7 set to 1.

The maximum number of graphics displays in Pascal is: two bit-mapped (only one of which may be a 98542/43/44/45A or Model 310 built-in), plus one compatibility, plus several 98627As (limited by available select codes).

HP-UX Terminals
This section only discusses how Series 300 operating systems *support* terminals *as peripherals*. All Series 300 mainframes can also *act as terminals* using the 98791B terminal emulation software. Note that Windows/9000 supports only a bit-mapped ITE display.

The **system console** in HP-UX is used for displaying boot ROM messages and for entering commands during the system installation. Once installed and running, HP-UX uses the console only when in the single-user state or for displaying certain serious error messages; it is otherwise an ordinary user terminal.

The selected built-in, 98540-series or 98700H display (along with the mainframe HP-HIL keyboard) is known as the "internal terminal emulator", or ITE. Once HP-UX is running, the ITE acts much like an HP2622A terminal. If an actual terminal (not an ITE) or ROM-based terminal emulator (such as the HP 150) is used as system console, it must have a 24-line×80-column display, Xon/Xoff handshaking and support HP cursor addressing. HP-UX does not presently support HP-HIL devices (including keyboards) attached directly to the 98700H. Use the mainframe HP-HIL interface.

Speed - The performance of a terminal is typically specified in *baud*. To convert this to (approximately) characters-per-second, divide by ten. You can configure all of the supported terminals for 9600 baud, and many for 19,200 baud. Although all terminals can transfer up to 80 characters at their specified maximum rate, the average for larger transfers may be lower. The table lists the aggregate throughput in baud.

Graphics - Use of graphics terminals with *Starbase* and DGL software at data rates higher than 1200 baud requires the 98642A Mux or 98628A Datacomm interface. Only these interfaces have the necessary buffering to prevent overruns of information read back from the terminal by the graphics device handler.

The maximum number of terminals (ITEs or actual terminals) is limited by the system's single- or multi-user license. See the HP-UX discussion in **Chapter 2** for details.

Series 300 Graphics Output Devices

Series 300 Graphics Display Summary
(ordered by increasing performance)

Product	Size inches	Speed Vectors/Sec.	Resolution Hor.×Vert.	Color Palette
HP150[1] terminal	10	125	512 × 390	1 (green)
HP150-II[1] terminal	12	125	512 × 390	1 (green)
2623A[1] terminal	12	250	512 × 390	1 (white, green or amber)
2627A[1] color terminal	12	250	512×390×3	8
2393A[1] terminal	12	250	512 × 390	1 (green)
2397A[1] color terminal	12	250	512×390×3	8 of 64
2625A[1] terminal	12	500	512 × 390	1 (white, green or amber)
2628A[1] terminal	12	500	512 × 390	1 (white, green or amber)
98627A+13279B video	19	1000	512 × 512	8
98546A[2] compat. video	12, 14	1200	512 × 390	1 (white, green)
built-in/98542A[2] video	12, 14	1200*	512 × 400	1 (white, green)
98543A+35741[2] video	12	1200*	512 × 400	16 of 16777216
98544A+98781A[2] video	17	6000§	1024 × 768	1 (white)
98545A+98782A[2] video	19	6000§	1024 × 768	16 of 16777216
98700H[2] station	19	7000	1024 × 768	16 of 16,777,216
Option 701				256 of 16,777,216
Option 710		60,000		

Series 300 Graphics Plotter Summary

Plotter Product Number	Media Sizes	Mechanical Resolution	Pen Speed	Pen Acceleration	Number of Pens	Media Feed	Pen Types
7470A Option 002	A	0.025	54	2g	2	Manual	P,T
7475A Option 002	A, B	0.025	54	2g	6	Manual	F,P,T
7550A	A, B	0.025	80	6g	8	Sheet	D,F,P,R,T
7580B Option 051	A - D	0.003	60	4g	8	Manual	D,F,P,R
7585B Option 051	A - E	0.003	60	4g	8	Manual	D,F,P,R
7586B Option 051	A - E	0.003	60	4g	8	Roll	D,F,P,R

F = reFillable drafting, D = Disposable drafting, P = fiber-tip Paper, R = Roller ball, T = fiber-tip Transparency

The Series 300 operating systems do not require a graphics device. The selection of such devices depends entirely on your intended use. There are several criteria you may wish to use.

CRT **displays** provide *softcopy* graphics. Without a printer or plotter, the only way to make a permanent copy of the screen is with a camera. The **Speed** is given for HP-UX Starbase graphics and 50-pixel vectors.

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* Model 310 with 98635A floating point math card.

§ Model 320.

1 Raster graphics printing to a terminal-interfaced printer only.

2 Raster graphics printing to a system-interface printer only.

Many **printers** can generate a hardcopy of a displayed CRT image. This method is faster than plotting, but is limited to a single color. The graphics resolution of printers was given in the previous section. Where the resolution of the display exceeds that of the printer, BASIC offers a Gdump_rotated CSUB to fit large images on printers up to 768 dots wide. The HP-UX *dump_graphics.c* command is supplied in source form so that you may optimize it for your display/printer combination.

Plotters provide high resolution multiple-color *hardcopy* of graphics. This requires re-executing the program which generated the CRT image and directing its output to the plotter.

Media Size - shown per ANSI nomenclature. ANSI/ISO sizes are A/A4, B/A3, C/A2, D/A1 and E/A0.

Mechanical Resolution - shown in mm. The addressable resolution typically is different.

Pen Speed - shown in cm/sec.

Plot Spooling
Programs in all operating systems can direct their plotter output (a stream of HP-GL commands) to a disc file for deferred or spooled plotting. HP-UX can also redirect terminal graphics output.

Maximum Configurations
Maximum Video displays - BASIC and Pascal support two bit-mapped displays (built-in, 98540-series or 98700H), one 98546A compatibility interface and several 98627A color video interfaces (select-code limited).

On all systems the practical limit is one 98700H since none of the systems support the HP-HIL port of the 98700H (all HP-HIL devices must therefore use the Series 300 mainframe HP-HIL interface).

Maximum Graphics Terminals - (in HP-UX) are subject to the same limitations as alphanumeric terminals.

Maximum Plotters - is limited only by HP-IB interfaces and select codes in BASIC and HP-UX, and by logical units in Pascal.

Series 300 Human Interface Accessories

Series 300 Human Interface Summary

Product Number	Description	Interface Required	Cable Included
	Keyboards		
46020A	U.S. English keyboard	HP-HIL	None
46020AC	French Canadian keyboard	HP-HIL	None
46020AD	German keyboard	HP-HIL	None
46020AE	European Spanish keyboard	HP-HIL	None
46020AF	French (AZERTY) keyboard	HP-HIL	None
46020AH	Dutch keyboard	HP-HIL	None
46020AJ	Katakana/JASCII keyboard	HP-HIL	None
46020AL	English Canadian keyboard	HP-HIL	None
46020AM	Latin Spanish keyboard	HP-HIL	None
46020AN	Norwegian keyboard	HP-HIL	None
46020BP	Swiss German keyboard	HP-HIL	None
46020BQ	Swiss French keyboard	HP-HIL	None
46020AS	Swedish keyboard	HP-HIL	None
46020AU	United Kingdom English keyboard	HP-HIL	None
46020AW	Flemish/Belgian keyboard	HP-HIL	None
46020AX	Finnish keyboard	HP-HIL	None
46020AY	Danish keyboard	HP-HIL	None
46020AZ	Italian keyboard	HP-HIL	None
46086A	32-Button Box	HP-HIL	0.8...3m
	Graphics Input/Picking Devices		
35723A	*HP-Touch* bezel for 35731/41 CRT monitors	HP-HIL	None
46060A	HP Mouse, two-button	HP-HIL	1.4m
46083A	Rotary Control Knob	HP-HIL	0.5m
46085A	Control Dials	HP-HIL	0.5m
46086A	Button Box	HP-HIL	0.8...3m
	Digitizers and Tablets		
17623A	A-size tablet	2623/27A	Included
46087A	A-size digitizer	HP-HIL	0.8...3m
46088A	B-size digitizer	HP-HIL	0.8...3m
46089A	4-button cursor for 46087/88A	46087/88A	Included
9111A	A-size tablet	HP-IB	None
	Bar Code Readers		
39800/01A	Bar code reader	RS-232C	None
92911A	Bar code reader	Some 2620-series	Included
92915A	Bar code reader	2392A, 45610A/B	Included
92916A	Bar code reader	HP-HIL	0.5m
	HP-HIL Extensions		
46080A	2.4m Extension (no audio)	HP-HIL	2.4m
46081A	2.4m Extension (with audio)	HP-HIL	2.4m
46082A	15m and RGB coax extension (with audio)	HP-HIL	15m, 0.5m
46082B	30m and RGB coax extension (with audio)	HP-HIL	30m, 0.5m
	Software Security Device		
46084A	ID Module	HP-HIL	0.5m

HP-HIL devices may be used with:

- The built-in HP-HIL interface of a Series 300 mainframe.
- The HP-HIL interface of an HP45850A *Touchscreen-II* PC (HP-UX only). Refer to 45850A in **Appendix A** for a list of HP-HIL devices supported. In general, the resolution of a graphics input device (mouse, digitizer) is limited to screen resolution when connected to a terminal.
- The HP-HIL interface of an HP2393A terminal (HP-UX only). Refer to 2393A in **Appendix A** for a list of HP-HIL devices supported. In general, the resolution of a graphics input device (mouse, digitizer) is limited to screen resolution when connected to a terminal.

The HP-HIL port of the 98700H display station is not presently supported by any Series 300 operating system. Connect HP-HIL devices to the computer mainframe HP-HIL port.

All 46020-series keyboards (except the 46020AJ) can generate any HP ROMAN8 character. On those keyboards where the desired character is not represented by a keycap, the Extend Char key is used in conjunction with one or more other keys. The 46020AJ Katakana keyboard can generate only KANA8 (JASCII and Katakana) characters.

All Series 300 systems include a 0.8-3.0m coiled HP-HIL cable. The bundled systems also include a 46020-series keyboard.

See the 98561-66530 in **Appendix A** for a discussion of HP-HIL cabling rules.

Series 300 Printers

Series 300 Printer Summary
(listed in approximate order of increasing speed)

Product Number	Speed	Tech-nology	Character Resolution	Paper Size	Graphics Resolution	Fonts	Inter-face	PCL
2602A Opt. 046	25 cps	FCI	Full	15.2	NA	Disc	HP-IB	NA
2601A Opt. 826	40 cps	FCI	Full	15.2	NA	Disc	RS232	NA
2671A	120 cps	Thermal	7×11	8.5	NA	ROM	HP-IB	NA
2671G	120 cps	Thermal	7×11	8.5	90×90	ROM	HP-IB	1
2673A	120 cps	Thermal	7×11	8.5	90×90	ROM	HP-IB	2
2225A	150 cps	Inkjet	11×12	8.5	96×96	ROM	HP-IB	1
82906A	160 cps	DMI	9×9	10	72×72	ROM	HP-IB	1
2932A Opt. 046	200 cps	DMI	9×12	14	90×90	ROM	AMIGO	2
2934A Opt. 046	200 cps	DMI	9×12,36×24	14	90×90	Ctg.	AMIGO	3
2563A Opt. 200	300 lpm	DMI	5×9,7×18	16.7	70×72	ROM	HP-IB	2
2563A Opt. 850	300 lpm	DMI	5×9,7×18	16.7	70×72	ROM	CIPER	2
9876A	480 lpm	Thermal	5×7	8.5	77×77	ROM	HP-IB	NA
2686A	8 ppm	Laser	30×53	8.5	72-300	Ctg./Soft	RS232	3
2565A Opt. 200	600 lpm	DMI	5×9,7×18	18.0	70×72	ROM	HP-IB	2
2565A Opt. 850	600 lpm	DMI	5×9,7×18	18.0	70×72	ROM	CIPER	2
2566A Opt. 200	900 lpm	DMI	5×9,7×18	18.0	70×72	ROM	HP-IB	2
2566A Opt. 850	900 lpm	DMI	5×9,7×18	18.0	70×72	ROM	CIPER	2

The Series 300 operating systems do not require a printer. The selection of a printer depends entirely on your intended use. There are several criteria you may wish to use.

Speed - expressed in *characters per second* (cps), *lines per minute* (lpm) or *pages per minute* (ppm) depending on the print technology employed. For program development, where the typical program listing is 60 lines per page with an average of 60 characters per line, cps approximately equals lpm, and you can convert ppm to lpm by multiplying ppm by 60. For 132 column reports, convert cps to lpm by multiplying cps by 0.45 (the lpm/ppm relationship is unchanged).

Technology - The choice of *impact* vs *non-impact* printing technology affects other criteria, primarily *multiple part* printing (possible only with impact) and *noise* (non-impact is quieter). Thermal printers also require special paper which is typically more expensive than impact paper. The abbreviations used are:

- DMI - Dot Matrix Impact
- FCI - Full Character Impact (e.g. Daisywheel)
- Inkjet - *Thinkjet* non-impact dot-matrix
- Laser - Laser Page Printing, non-impact
- Thermal - Thermal non-impact dot-matrix

Character Resolution - This is the number of horizontal × vertical dots used in the character cell. The 2560-series printers use half-dot shifting and can place the horizontal dots at about twice as many locations for higher apparent resolution. Those printers which list two resolutions have a "high density" mode (at lower speed).

Paper size - HP printers handle 8½-in. wide or 14⅞-in. wide paper. Most can handle paper narrower than their maximum size. Refer to **Appendix A** for details.

Graphics - Most HP printers can print monochromatic single-level grey scale graphics images. Where the printer has graphics, the resolution in *dots per inch* (dpi) is given. A range of resolutions is given for printers which can scale their graphics.

Fonts - All HP printers have at least one built-in printing font. Most offer additional fonts in one of the following forms:

Disc	-	Interchangable printwheel
Ctg.	-	Plug-in ROM cartridge
ROM	-	Fixed selection of ROM fonts
Soft	-	Downloadable software

Interface - CIPER and AMIGO printers have an intelligent HP-IB interface which allows the printer to share an HP-IB with other devices more efficiently than a simple HP-IB printer. This consideration applies only to the HP-UX system. Simple HP-IB printers should not be on the same bus as a disc in HP-UX. RS-232 printers may be connected to an RS-232C interface for local or remote printing.

Printer Command Language - Newer HP printers implement an HP-standard command set. Where supported, PCL level 1, 2 or 3 is indicated. The higher levels are full supersets of the lower levels. HP Raster Standard graphics printing is present at level 1. There is a summary of HP-PCL commands in the introduction of **Appendix A.**

Maximum Configurations
The maximum number of printers which may be connected to a Series 300 system:

- is limited in BASIC only by physical connections (select codes, addresses);
- is limited in HP-UX 5.0 to 8 CIPER and 8 AMIGO printers. Simple HP-IB printers are limited only by HP-IB interfaces (5). CIPER and AMIGO protocol printers are limited to a bus address range of 0...7. AMIGO printers can be configured for simple mode and operate at addresses outside the 0...7 range.
- is limited in Pascal by logical units ($\simeq$45).

Series 300 Miscellaneous Peripherals

Series 300 Miscellaneous Peripherals Summary

Product No. Options	Description	Supplied Cable(s)	Required Interface
92210A..D	**Cabinets and Furniture** Workstation tables. Refer to the **Computer Users Catalog** *HP. Pub. No. 5953-2450*	NA	NA
92210R	Suspended storage module for 92210A...D tables	NA	NA
92211L 92211M	523mm high cabinet rack for 325mm-wide devices 341mm high cabinet rack for 325mm-wide devices	NA NA	NA NA
92211R 92211S 92211T	575mm high cabinet rack for 325mm-wide devices Rail kit (set of four rails) Filler kit (set of 20 1-unit filler panels)	NA	NA
97064A	CAD worktable	NA	NA
98568A 98568T	**Bus Expanders** Series 300 HP-DIO bus expander Series 300 bus expander bundle, includes 98620B and 98625A	NA 2.0m HP-IB	NA NA
9888A	Series 200 HP-DIO bus expander	1.5m, Included	Included
19500B 98569A 19501A 19507A 98567A 98567B	**19-in. EIA Rack-Mount Adaptors** For 5-unit high 325mm-wide 285mm deep devices For 5- or 10-unit high 325mm-wide 376mm deep devices For 8-unit high 325mm-wide devices (*not* 7907A) For 7-unit high 325mm-wide devices (e.g. 7907A) For 35731 CRT monitors For 35741 CRT monitors	NA NA NA NA NA NA	NA NA NA NA NA NA

Cabinets and Racks

The 92211L/M/R *Design Plus* cabinets accept 325mm-wide HP computers and peripherals. Wider computers and peripherals (such as the 9888A Bus Expander) may be placed on top of the 92211L/M cabinets or in the bays of the 97064A table or 92210R storage module.

All cabinets are open in front. A 92211T filler panel kit is available for the 92211R cabinet. None of the cabinets include a power tap.

The height of *Design Plus* devices may be expressed in *Design Plus* **units**. Each unit is 26mm. 92211 cabinet rails may be installed at vertical intervals of one unit. All devices in the cabinet may stack on a single rail set. The 97064A table has one movable shelf in each of its two equipment bays. The following internal dimensions are available:

Series 300 Cabinets Summary

Cabinet Model	Description	Depth (mm)	Height (mm)	Height in *Design Plus* units	Rails or Shelf
92210R[1]	Suspended storage module for 92210A/B/C/D tables	671	432	16	Included
92211M	Roll-around rack	375	341	13	Included
92211L	Roll-around rack	474	523	20	Included
92211R	Roll-around rack	705	575	22	92211S
97064A[2]	CAD worktable	635	2×400	2×15	Included

325mm-wide devices listed in this guide have the following heights and depths:

HP *Design Plus* Compatible Products

Product Number	Description	Depth (mm)	Height in *Design Plus* units
9121D/S	3½-in. single-sided flexible disc	285	3
9122D/S	3½-in. double-sided flexible disc	285	3
35751M	2393A terminal processor	325	4
9125S	5¼-in. flexible disc	285	4
9153/54A	10 Mbyte discs	285	4
7941/45A	24/55 Mbyte discs	285	5
9133/34D	14-16 Mbyte discs	285	5
9133/34H	20-22 Mbyte discs	285	5
9144A	¼-in. cartridge tape	285	5
98561A	Model 310 computer	376	5
98561B	Model 320 computer	376	5
98580/81A	Model 310 systems	376	5
98582A	Model 320 system	376	5
98700A/H	Display controller	285	5
Option 710	Graphics accelerator	285	+5*
98568A	Series 300 bus expander	376	+5*
98710A	Graphics accelerator	285	+5*
7907A	21/21 Mbyte disc	447	6.5
7942/46A	24/55 Mbyte disc/tape	285	8
98583A	Model 320 system	376	10

1 The interior width of the module is 493mm.

2 The width of each equipment bay is 595mm in the 97064A.

* The 98568A must connect directly to the top of the Series 300 computer. The 98710A must connect directly to the bottom of the 98700A/H display controller.

Support Services

Chapter 5

HP offers a wide variety of services to ensure your success with your system. To provide the maximum flexibility, most of these services are not bundled into the price of the system. You select the level of support desired.

This table summarizes the various types of service available and whether or not each service is bundled into the original system.

Support Service	Inclusion with system
System Manager Training	Order separately
Programmer/User Training	Order separately
Site Preparation and System Installation	Depends on configuration
Software Consulting	Order separately
Hardware Service - initial	1-year or 90-day warranty
Hardware Service - ongoing	Order separately
Software Support Services	Order separately

Customer Training

The completion of user and system administrator level courses by your System Administrator is strongly recommended. It is a prerequisite for obtaining the Account Managment Support (AMS) or Response Center Support (RCS) services described later.

Ideally, you should schedule your training so that it is completed within a few weeks of system installation.

Course	On-Site Course	Course Title	Number of Days
35128A	35128X(10)	Introduction to HP-UX	5
35073A	35073X(10)	Series 200/300 HP-UX System Administration	3
35130A	35130X(10)	Programming in C Language	5
98510A	98510X(10)	Series 200/300 BASIC Operating and Programming	5
98511A	98511X(8)	Series 200/300 Pascal Operating and Programming	5

A syllabus for each course is available in the **HP Customer Education, Consulting and Implementation Services Guide** (*HP Pub. No. 5954-0142*).

These courses are offered at numerous HP Training Centers throughout the world. Consult the latest **Computer Systems Customer Training Schedule** for your area. Local versions of this schedule are updated twice a year. At time of publication, the latest North American schedule was *HP Pub. No. 5954-0121 (04/85-09/85)*

Those courses offered on-site show the number of students in parentheses. Additional students are specified as Option 001. The maximum quantity of Option 001s is given in the ordering information for the associated software product in **Appendix A.**

System Installation Services

Site Preparation - An HP Customer Engineer (CE) visits your site once to perform Site Planning and again later to perform a Site Survey of the prepared site.

System Installation - An HP CE supervises the uncrating, positioning and racking of HP products, interconnects the HP products, brings the system to an operating state and executes system verification tests. Reconfiguring of system software and installation of non-HP products are not included.

Series 300 computers are customer installed unless ordered with one or more of the following peripherals which require HP installation: *2563A, 2565A, 2566A, 7911P/R, 7912P/R, 7914CT/P/R/ST/TD, 7933H, 7935H, 7971A, 7974A and 7978A.*

All other HP products offer installation service either as an Option (101) or as an additional Time and Materials charge.

Refer to the following data sheets for detailed descriptions of these services:

- **Installation Support Service** Data Sheet, *HP Pub. No. 5953-8802.*
- **Installation Support Service** CSSA Exhibit, *HP Pub. No. 5953-8803(D).*

Warranties

The warranty covering a specific system is determined by the HP WARRANTY AND INSTALLATION TERMS in effect at the time of purchase. These terms are specified in *HP Pub. No. 5954-1617(D)* for the United States and similar documents for other countries. The following is a summary of the R03-85 revision of 5954-1617(D).

WARRANTY STATEMENT

HP hardware products are warranted against defects in materials and workmanship. If HP receives notice of such defects during the warranty period, HP shall, at its option, either repair or replace hardware products which prove to be defective.

HP software and firmware products which are designated by HP for use with a hardware product, when properly installed on that hardware product, are warranted not to fail to execute their programming instructions due to defects in materials and workmanship. If HP receives notice of such defects during the warranty period, HP shall repair or replace software media and firmware which do not execute their programming instructions due to such defects. HP does not warrant that the operation of the software, firmware or hardware will be uninterrupted or error free.

If HP is unable, within a resonable time, to repair or replace any product to a condition as warranted, Customer shall be entitled to a refund of the purchase price upon return of the product to HP.

DURATION AND COMMENCEMENT OF WARRANTY PERIOD

For Hewlett-Packard Series 300 computer system products sold in the U.S.A. and Canada, this warranty applies for one (1) year or ninety (90) days (specified on the initial order, at your option) from date of shipment*.

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* For other countries, contact your local HP Sales and Service Office to determine warranty terms.

The warranty period begins either on the date of delivery or, where the purchase price includes installation by HP, on the date of installation. If Customer delays installation more than thirty (30) days after delivery, the warranty period begins on the thirty-first (31st) day from the date of delivery.

PLACE OF PERFORMANCE

Within HP service travel areas, warranty and installation services for products installed by HP and certain other products designated by HP will be performed at Customer's facility at no charge. Outside HP travel areas, warranty and installation services will be performed at Customer's facility only upon HP's prior agreement and Customer shall pay HP's round trip travel expenses and applicable additional expenses for such services.

On-site warranty services are provided only at the initial installation point. If products eligible for on-site warranty and installation services are moved from the initial installation point, the warranty will remain in effect only if the Customer purchases additional inspection or installation services at the new site.

For product warranties requiring return to HP, products must be returned to a service facility designated by HP. Customer shall prepay shipping charges (and shall prepay all duty and taxes) for products returned to HP for warranty service. Except for products returned to Customer from another country, HP shall pay for return of products to Customer.

Installation and warranty services outside the country of initial purchase are included in HP's product price only if Customer pays HP international prices (defined as destination local currency price, or U.S. or Geneva Export price). Service outside the country of initial puchase is subject to the conditions regarding HP service travel areas and initial installation point described above.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from:

1. Improper or inadequate maintenance by Customer;
2. Customer-supplied software or interfacing;
3. Unauthorized modification or misuse;
4. Operation outside of the environmental specifications for the product; or
5. Improper site preparation and maintenance.

THE WARRANTY SET FORTH ABOVE IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF REMEDIES AND LIABILITY

THE REMEDIES PROVIDED HEREIN ARE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL HP BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFITS) WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

The foregoing limitation of liability shall not apply in the event that any HP product sold hereunder is determined by a court of competent jurisdiction to be defective and to have directly caused bodily injury, death or property damage; provided, that in no event shall HP's liability for property damage exceed the greater of $50,000 or the purchase price of the specific product that caused such damage.

Hardware
The Series 300 computers and expanders are covered by a one-year return-to-HP warranty with a level of service similar to the *Field Repair Center* maintenance (FMMC) described in the next section. Most plug-in cards and accessories not bundled into the computer or ordered as Options are covered by a 90-day return-to-HP warranty.

You may change the one-year return-to-HP warranty to a 90-day on-site warranty with a level of service similar to the BMMC service described in the next section by ordering the computer and expander with Option W03.

Terminals, peripherals, accessories and interfaces receive the same warranty service as the systems to which they are connected when:

- the products are purchased on a coordinated delivery and are included in the system configuration, or
- the products are purchased as add-ons to an existing HP system covered by an HP service agreement which is extended to include the add-on products.

Software
Hewlett-Packard software is covered (during the term of the computer mainframe warranty) by a return-to-HP warranty which is limited to replacement of defective media unless you order a software support service. For both hardware and software you may upgrade the level of support during the warranty by purchasing maintenance and support services.

Hardware Maintenance Services

For service after warranty, HP offers several levels of hardware support services to match your requirements.

Availability of contract services and on-site response depends on the distance from your site to the nearest HP Service Office (travel zone). Refer to the **Support Services Travel and Office Directory** (*HP Pub. 5953-7167*).

Service	Where	Coverage Period		Response
SMMC	On-site	5-7 days	13-24 hours	Same day
BMMC	On-site	5 days	9 hours	Next day
PMMC	On-site	5 days	9 hours	Next day
VRC	On-site	5 days	9 hours	Scheduled
FMMC	At HP	NA	NA	3 days

Service is also available at Time-and-Materials (T&M) rates or Standard Repair charge (STREP) at your site or at an HP Field Repair Center.

These services are described in the following literature:

Service	Literature	Data Sheet	CSSA/Exhibit
CSSA	Customer Support Services Agreement	None	9320-4077
	Hardware Support Service	5953-5216	None
	Series 200 Service Prices	5953-8823(D)	None
SMMC	Standard System Maintenance	5953-7184	2A - 5953-8837(D)
BMMC	Basic Maintenance	5953-7185	2B - 5953-5218(D)
PMMC	On-site Product Maintenance	5953-7186	2C - 5953-3310(D)
	Workstation On-Site Maint.	5953-8819	None
VRC	Volume On-site Repair Center		2L - 5953-8808(D)
FRC	Field Repair Center	5953-7187	2D - 5953-3311(D)
	Pick-Up and Delivery Service	5954-0114(D)	2M - 5954-0106(D)
STREP	Standard Repair Price	5953-5236	None
T&M	Time and Materials	5953-7188	None

Ordering Information
Maintenance services are available to any HP customer who has a signed Purchase Agreement in effect. Contract services are ordered by executing a **Customer Support Services Agreement** (CSSA).

Not all HP products have all levels of service available. For contract services, all components of the minimum required system (computer, disc, console) must be on the same level of service. Other components may be on different levels of service.

If you execute a maintenance agreement (for a period of at least one year) before delivery of your system, an additional 90 days is provided at no additional charge.

Software Consulting

In addition to the Response Center and Assigned Account SE services described in the next section, HP offers fixed-rate, on-site assistance of a trained Systems Engineer to assist you in the configuration and use of your HP software.

Product Number	Description	Rate
35021B	General HP 9000 Consulting	Hourly
35032B	General HP 9000 Consulting	Daily

This service is described in **Customer Training and Consulting Guide**, (*HP Pub. No. 5953-5242*), and **SE Assistance** (*HP Pub. 5953-5203(D)*).

Start-up Consulting
Although all HP 9000 software is designed and documented to be customer installed, you will be able to more quickly and efficiently use your system if you request "start-up" consulting. The suggested amounts of start-up consulting are listed for selected software products in **Appendix A.**

Software Support Services

Software support services for all operating systems and most applications are ordered as separate products and are not automatically included with Series 300 systems. The following table lists the support service products.

Support Service Description	Data Sheet, CSSA Exhibit
HP Software Support for Technical Computers	5954-0111
HP Software Support for Additional Systems	5954-2781
ASC - AMS/RCS Additional System Coverage	
System Implementation and Support Planning Guide	5954-0119
AMS - Account Management Support	5954-2767(D), 18T
CAAP - Credit Approval/Authorized Personnel	5953-5208(D)
RCS - Response Center Support	5954-2768(D), 18H
Personal Computer Assistance Program	5954-2765(D)
SMS - Software Materials Subscription	5954-2769(D) ,18S
EMS - Extended SMS	
SNS - Software Notification Service	5953-7180
MUS - Manual Update Service	5953-7180
T&M - Time and Materials Assistance	5953-7173
Off-Hours Emergency Assistance	5953-5204

HP-HelpLine Support

The application software packages in the following table are eligible for HelpLine phone-in support on a charge-per-call basis. You may charge the call to a major credit card or pre-purchase **HP HelpLine Call Certificates**. Each certificate entitles you to one-time, one-topic telephone assistance. A pack of five certificates is HP product number 35159A.

Product	Description
45462B	Picture Perfect™
45463B	Diagraph™
45481B	Context MBA®
45537B	Graphics Editor/200
45538B	Text Editor/200

Contractual Support Service Products

For all operating system, programming language and selected application software products supplied by HP, software support is available at several levels on a per-product basis. The specific support product numbers for a given software product are given in **Appendix A** for each software product. There are five levels of services available, summarized in the following table. "RTC" means "Right-to-Copy". The abbreviations are expanded on the preceding page.

Context MBA is a registered trademark of Context Management Corp.

Contract Service	AMS	ASC	RCS	ASC	SMS	EMS	SNS	MUS
Account Responsible SE	Yes	Yes	-	-	-	-	-	-
On-site Response	Yes	Yes†	-	-	-	-	-	-
Telephone Assistance	Yes	Yes†	Yes	Yes†	-	-	-	-
Software Updates	Yes	RTC	Yes	RTC	Yes	RTC	-	-
Software Manual Updates	Yes	RTC	Yes	RTC	Yes	RTC	-	Yes
Software Status Bulletin (SSB)*	Yes	RTC	Yes	RTC	Yes	RTC	Yes	-
communicator Magazine*	Yes	RTC	Yes	RTC	Yes	RTC	Yes	-

For HP-UX systems, Account Management Support (AMS) is strongly recommended for at least the first year of system use. To qualify for AMS, there must be a system administrator or applications manager who has completed the appropriate training courses or who has equivalent experience.

The Response Center telephone service provided with the AMS and RCS services is limited to the named system administrator and one named alternate who has the same level of training or experience.

The ASC/EMS "Additional System" and "Extended" services provide a discount for multiple system support. This is intended for cases where the same system administrator is responsible for all of the systems covered. The ASC updates confer the right to reproduce the software and manuals received on an AMS/RCS/SMS contract. Therefore, for each product on "additional" support, there must be at least one copy of the product on AMS, RCS or SMS.

The MUS service is offered for those who require manual updates for the extension systems and do not wish to perform the duplication. It is also provided for systems where multiple users must have complete and up-to-date manual sets.

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* Only Operating or Language System services and SNS include these items.

† Support is through the central site system manager.

Ordering Information - Central System

Unlike hardware support, software support is orderable as a product. The order quantity is in months of service with a minimum of three. On the initial order (not on renewal or upgrade) 15 months of service is provided if 12 months are ordered. (Put another way, the 90-day software warranty is upgraded to the level of the support service purchased.) Follow these steps:

1. Order a *level of support and update medium for each operating system*. Specify an original software product number (such as 97033A HP-UX) and a suffix from the following two tables.

Suffix	Level of Support Description
+Txx	AMS - Account Management Support (available only for HP-UX)
+Hxx	RCS - Response Center Support
+Sxx	SMS - Software Materials Service

Suffix	Media Description
+x22	¼-in. data cartridge (HP-UX only)
+x43	5¼-in. double-sided flexible disc (BASIC, Pascal only) "external" format
+x44	3½-in. single-sided format flexible disc (BASIC, Pascal only)
+x45	3½-in. double-sided format flexible disc (all systems)

Example: 97033A+H22 RCS for HP-UX, software updates on ¼-in. data ctg.

2. If you have selected AMS or RCS for your operating system, identify the software products (other than operating systems) to be used in the system. Note that each product falls into one of the support service categories or families in the following table. Order the *category* or *family* support service. This extends the AMS or RCS level of support to any software products in each category ordered. The category and family services for each software product are listed with that product in **Appendix A**.

Category Name	Support Service
Languages	99081F+C00
Data Management	99083F+C00
Utilities	99084F+C00
Datacomm-A	99085F+C00
Datacomm-B	99086F+C00
Datacomm-C	99087F+C00

Example: 99083F+C00 Data Management category support for 98819A HP Techwriter

The *category* support service extends the level of support you have on the operating system to all the products in the category. The *family* support may have a different level (higher or lower). Order the desired level.

Family Name	Support Service	Level
Computer aided ME*	99107F+T00	Family AMS support
	99107F+H00	Family RCS support
	99107F+V00	Family ASC support

Example: 99107F+H00 Family RCS support for ME applications, such as HP EGS

3. Regardless of the level of operating system and category support, order a *Software Materials Service* for each optional application software product for which you desire materials updates. Specify the software product number followed by "+S00".

   Software updates are delivered on the same media as specified for the operating system AMS, RCS or SMS. If you have multiple systems and are adding support to an existing contract, the correct existing contract must be referenced on the order to ensure that the desired media is obtained.

   Example: 98693A+S00 SMS for HP-UX SRM Access Software

Additional Services

An AMS or RCS contract for a single operating system provides for only a single authorized Response Center caller. For each additional Response Center caller desired, order one of the following products:

Product	Description
98081A+P00	Additional caller for BASIC or Pascal
98670A+P00	Additional caller for single-user HP-UX
98680A+P00	Additional caller for multi-user HP-UX

If you have more than one complete manual set for an operating system, category or application family, only the first set is updated by the Software Material Service (SMS). You can obtain updates for each additional set by ordering a *Manual Update Service* (MUS). Specify the operating system, category or family product number with a "+Q00" suffix.

Example: 97033A+Q00 MUS for HP-UX

The Software Materials Service for an operating system includes a single subscription to the *commmunicator* magazine and the *Software Status Bulletin (SSB)*. If you do not have SMS, or desire additional copies of these publications, order one of the following products:

SNS Product	Description
97033A+N00	Software Notification Service for Series 200/300 HP-UX
97081A+N00	Software Notification Service for BASIC and Pascal

All software products in a single system which are on a support service must be on the same level of support with the exception of applications covered by a *family* support service.

To qualify for AMS, RCS and SMS services, the software must be at the current revision level. HP-UX updates occur no more often than twice per year. BASIC and Pascal Language System updates occur no more often than once per year.

Additional System Coverage

To extend AMS, RCS or SMS coverage to an additional system, follow these steps.

1. If the central system is on AMS or RCS, specify the central system operating system product number followed by one of these suffixes:

   +V00 Extends central "+Txx" or "+Hxx" AMS/RCS coverage to one additional system

   +W00 Extends central "+Sxx" SMS coverage to one additional system

   Example: 97033A+V00 Extend HP-UX AMS to an additional system

2. The additional system coverage includes no manual updates and only the right to reproduce operating system updates, not the updates themselves (except in the case of HP-UX). If you prefer to have HP update the manuals or software, specify the desired media as the product number followed by "+Vxx" or "+Wxx", where "xx" is the media option. A media option must be specified for HP-UX.

3. Order *category* and *family* support services for the additional system. From the list of category services specifed for the central system, specify all of the same product numbers which apply to the additional system, but with a suffix of "+V00" replacing the "+C00".

   Example: 99081F+V00 Extend 99081F+C00 to one additional system

4. For each central software product used on the additional system, order an *Extended SMS* (EMS). EMS confers the right to reproduce the software and manuals provided with the central system's AMS, RCS or SMS service.

   To order an EMS service, specify the original software product number followed by a "+W00" suffix.

   Example: 98693A+W00 Right to copy 98693A+S00 updates for one additional system

   If you prefer to have HP provide the materials, simply order SMS ("+S00") instead of EMS ("+V00") for the additional systems.

Detailed Product Reference

Appendix A

This appendix contains support and ordering information that is specific to each product. Products are listed in alphanumeric order, that is, 46020A occurs before 9876A.

The organization of a typical hardware product entry is as follows:

12345A Sample

Product description emphasizing distinguishing features.

12345A/Series 300 Support Summary
A short matrix of mainframe qualification and software support.

12345A Specification Summary
A list of product specifications germane to use with the Series 300

12345A HP-DIO, HP-HIL or HP-IB Characteristics
A summary of technical information about the device's interface.

12345A/Series 300 Interfacing
Interfacing information common to all supporting Series 300 configurations.

12345A/Series 300 BASIC Interfacing:
Interfacing information specific to Series 300 BASIC.

12345A/Series 300 HP-UX Interfacing:
Interfacing information specific to Series 300 HP-UX.

12345A/Series 300 Pascal Interfacing:
Interfacing information specific to Series 300 Pascal.

12345A Ordering Information
Includes support products, accessories and supplies.

Support Summary - Background Information

To be supported, a device must be *qualified* on the computer model being considered *and* have *software support* on the operating system being considered. This means the device must appear in the appropriate column under "Hardware Support" and "Earliest Operating System Version".

For software support, the tables show the earliest system version available for the Series 300. Earlier systems may support the device on a Series 200 system. All later versions of the system also support the device.

The status of peripherals "Planned" and "Inves." may change within 30 days of the print date of this summary. Contact your HP Sales Representative for the most recent peripheral support information.

A "Yes" under "Hardware Support" means that the peripheral complies with at least FCC Class A and at least VDE/FTZ Level A in a system configuration. These classifications refer to the electromagnetic interference (EMI/RFI) properties of the system. It also means that a diagnostic or exerciser program exists for that mainframe and HP offers on-site service of the system.

A *number* (such as 5.0) in a software support column indicates the earliest version of the operating system for which device-supporting software exists and in which the peripheral has been tested.

"Planned" means that testing was in progress at time of publication and that HP is likely to support the configuration indicated by that entry. Contact your HP Sales Representative for current information.

"No" indicates that the peripheral is not supported by the mainframe or operating system shown in that column *and does not work*. "No" in a hardware column indicates that the device has no interface or cable. "No" in a software column indicates that the device either has no supporting software or cannot perform all functions required for reasonable use.

"Unsup." indicates that the device is untested and no testing is planned. These devices are unsupported and should not be purchased for use with the mainframe/operating system under which the "Unsup." appears. Although Series 300 software is essentially identical to Series 200 software, not all peripherals supported by the Series 200 have been qualified on the Series 300. This means it is possible for a device to be supported by the *software* but not by the *hardware*.

"Inves." indicates "under investigation" and that HP desires to support the device, but significant technical issues must be resolved first.

"NA" indicates "not applicable".

Unsupported Products

To afford our customers use of their investment in older HP peripherals, software for all Series 200 peripherals (and some peripherals which were never officially supported) has been left in the Series 300 versions. For example, you may be able to temporarily connect an obsolete disc drive to your Series 300 system and transfer files to a supported disc.

You should not rely on being able to use an unsupported device as a critical component in your Series 300 system. And, under no circumstances should you **purchase** *an unsupported HP device for use on your Series 300 system.* "Unsupported" implies the following:

- Installation, cabling and configuration of the unsupported device may not be well documented, if at all. HP field personnel may therefore be limited in their ability to assist you.
- HP response centers (AMS, RCS or HP HelpLine support) are not obliged to respond to inquiries about unsupported devices.
- If a problem is discovered in the system software, firmware or hardware, HP does not commit to correct it. HP assistance in isolating and characterizing problems relating to unsupported devices is provided on a time-and-materials basis.
- HP may not execute an on-site service contract for a system which includes one or more unsupported devices. This is due to our inability to diagnose problems on site. HP will not execute an on-site service contract if one or more of the components of the "minimum system" is an unsupported device.
- When you connect an unsupported peripheral to a computer, you assume responsibility for the RFI emissions of the complete system. If the system causes radio frequency interference, you must take whatever steps are necessary to correct the problem.

Unsupported Features of Supported Devices

In the context of this manual, "supported" means transparently supported by the operating system. Many "unsupported" features of peripherals are supported by HP and non-HP applications programs which execute in Series 300 systems.

In general, those device features which are accessed via control characters, escape sequences or HP-IB secondary commands in the output data stream are functional under the control of a user program. Examples include: alternate character sets, fonts, status readback and remote device configuration. To the extent possible, this manual documents those features which are *known to not work*, such as block mode terminal I/O.

And, in general, those features which require a non-supported configuration of the device will not work. Examples include: Centronics, 16-bit differential, HP-MTS, DSN/DL master connections (no interfaces available). Others (such as RS-232C or HP-IL interfaces) may work, but have never been tested.

HP-IB Background Information

General HP-IB terminology is discussed in this appendix under the 98624A interface.

Unless otherwise noted, each bus address that a device has represents an HP-IB connector, requiring a cable. "1+1" device addresses implies that there are two HP-IB connectors, each requiring a separate cable.

Standard loads listed as "1...7" indicate that the number of loads is variable, depending on the placement of load resistor packs on the HP-IB interface inside the device.

Characteristics of Options are shown as the **effect** the Option has; "+" is an increase, "-" is a decrease. Add the effect of the selected Options to the characteristics of the standard product.

"Normal" means that the device is a normal (standard) speed talker and listener supported *only* by a normal speed HP-IB interface (such as a built-in or 98624A). "High" means that the device is a *high speed talker*. All listed high speed devices may be used with a normal speed HP-IB interface (at lower performance).

"N or H" means that the device is a *normal speed talker* but can *listen* to a high speed talker and is also supported by the 98625A disc interface. "H or N" means that the device is a *high speed talker* but is also compatible with normal speed talkers and listeners.

HP-UX Terminal Support

HP-UX supports HP terminals via direct-connection or via modem. Your system console must be an ITE or an HP terminal having the following characteristics:

- 24 line × 80 column display
- supports the following HP escape sequences: $^{E}c\,^{E}cJ$, $^{E}c\,\&a..Y$, $^{E}c\,\&a..C$
- Xon/Xoff receive handshake
- 9600 baud, eight bits/char (parity none, one stop bit if connected to a 98642A, 98644A, Model 300 built-in RS-232C interface)
- can transmit the full uppercase ASCII character and numeric sets
- has a BREAK key

Although various HP terminal emulator software programs (98791B, 97056A, 82815J) meet these criteria, the use of a software-based terminal emulator as system console is discouraged due to the difficulty of determining where the problem is if no boot-up messages are seen. ROM-based emulators such as the HP 150 are acceptable as system console.

Although only HP terminals are supported, it is possible to communicate (other than as system console) with virtually any RS-232C device which has the following attributes:

- Can transmit the entire ASCII character set (including control characters). Can display the entire upper and lowercase ASCII set. Has at least CR and LF cursor/printhead control.
- Has a BREAK key
- Can transmit and receive at one of the following baud rates: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600 and 19,200.
- Supports 7 or 8 bits per character (some interface cards support 5 and 6 bits per character, but this is generally useful only under the control of an application program)
- Has one or two stop bits and NONE, ODD or EVEN parity.
- Has Xon/Xoff receive handshaking (terminals slower than 600 baud and terminals which can accept DEL or NUL fill characters for pacing may not require this)

To use non-HP terminals with programs that use the *curses* library or TERMCAP (such as *vi*) requires that you create a *terminfo* or TERMCAP entry for the terminal. Although documented, this is not trivial.

HP Terminal Feature Support

The following features of HP terminals are fully (although not always transparently) supported:

- All character-generating keys (both displayable and control) from the ASCII set. Many commands also accept characters from the extension set of HP ROMAN8.
- The BREAK key (a non-character key).
- As shipped, the *vi* editor supports the cursor motion ("arrow") keys. (You can easily extend *vi* support to the other editing keys with :map commands.)
- Enable and disable display enhancements (inverse video, underline, etc.). Access to alternate character sets (math, linedraw, bold, italics, etc.) requires user-provided escape sequences and control characters in the output data.
- User-defined softkeys (locally configured or downloaded).
- Terminal status readback (used by DGL and *Starbase* graphics).

The following unsupported features of HP terminals are accessible:

- Local peripheral I/O and control. Escape sequences in output user data can enable and disable these features.
- The ENTER key and its programmed equivalent in LINE mode only.
- Enq/Ack and HP-DC1/DC2 handshake. If required, these could be implemented via *pty*.
- File transfer between HP PC/terminals (such as 110 and 150) and HP-UX. Software is available in the public domain for this function. Your local SR or SE may be able to direct you to a source for such programs.
- FORMAT mode for data entry, although without BLOCK mode support, this is non-trivial to program.

The following HP terminal features are unsupported and may not work in the HP-UX environment:

- Block mode. Data overruns (loss) is likely on unbuffered interfaces, even if the HP-DC1/DC2 handshake is implemented.
- Graphics terminal raster readback. Only the 2393A presently has this feature.
- Fast binary read and upload/download of binary data. On terminals which support this, a hardware handshake (not implemented on HP-UX) is generally required.

Typical terminal configuration

The following is a list of suggested terminal configuration attributes compiled for HP 2382, 2390-, 2620-, 2640-series terminals and the HP 110 and 150 PC/terminals. Not all attributes apply to all terminals. In particular, if your terminal has on-screen configuration, then it does not have any internal switches. On the other hand, 2640-series terminals are configured largely by switches on the keyboard interface (noted by brackets []) and switches on the 13260A/B datacomm interface (if present).

WARNING

DISCONNECT AC POWER BEFORE OPENING 264X-SERIES TERMINALS. HAZARDOUS VOLTAGES ARE PRESENT INSIDE THE EQUIPMENT. AC power must be removed and re-applied in any case before changed switch settings are acknowledged by the terminal.

Terminal Feature	State	Comments
Alternate Set	Line(B)	Suggested (some applications may assume)
ASCII 8 Bits	No	[Yes] Required for NLS support
Asterisk	Off	Suggested
AUTO LF	Off	Required
Auto Terminator [J]	No	Suggested (only affects BLOCK MODE)
Baud Rate	9600	Default for hardwired connections
Bell	On	Suggested (does not usually affect ^G bell)
BLOCK MODE	Off	Required
Block Terminator	$^{R}_{S}$	Suggested
Break Time	200ms	160ms default OK for ≥1200 baud
BufSiz	128	Suggested
Caps Lock	Off	Safe to change *after* login
Carrier Detect [V]	Open	Suggested for hardwired
Check Parity	No	Required if Data Bits = 8
Circuit Assurance [R]	Closed	Cabling may require
Clear Terminator [K]	No	Suggested (only affects BLOCK MODE)
Clock	INT	Required
CPU Break [U]	Open	Suggested
CS(CB)Xmit	No	Cabling may require
Cursor Type	Line	Your choice
Data Bits	7	[8] Required for NLS support
Data Speed Select [X]	Open	Suggested (does not affect baud rate)
Datacomm Handshake [W]	XonXoff	Required
DISPLAY FUNCTIONS	Off	Suggested
Display Off After	<your choice>	15 min. suggested
DM(CC)Xmit	No	Cabling may require
EnqAck	No	Series 200/300 does not support Enq/Ack
Esc Xfer [N]	Yes	Suggested (only affects terminal peripherals)
Fast Binary Read [F]	Closed	Suggested (feature not supported)
Field Separator	$^{U}_{S}$	Suggested
GraphCompat	<your choice>	Application-dependent

Terminal Feature	State	Comments
Inh DC2 [H]	Yes	Required for graphics or if ENTER or softkeys used
InhDcTest [W]	Yes	Suggested
InhEolWrp [C]	No [Closed]	Required (you may confuse *vi* otherwise)
InhHndShk [G]	Yes	Required for graphics or if ENTER or softkeys used
InhSlfTst [L]	No	Suggested
Insert and delete sense	Closed	Suggested (you may confuse *vi* otherwise)
Inverse Background	<your choice>	
Keyboard	→	Should match your keyboard
LINE MODIFY	Off	Suggested
Line/Page [D]	Line	Required
Local Echo	Off	Suggested: default transmission mode is FDX
Main Channel [S,T]	Closed	Should have no effect
MEMORY LOCK	Off	Suggested
MODIFY ALL	Off	Suggested
Parity [Z]	Enabled [Closed] and Odd	None [Open] Required for NLS support
Power On	Terminal	Suggested
Printer Code 4	<your choice>	(only affects terminal printers)
Printer Nulls	<your choice>	(only affects terminal printers)
RecvPace [W]	XonXoff [Open]	Required above 300 baud
Remote/Serial Dev	PORT1/PORT2	If using port 1 to HP-UX PORT2/PORT1
	PORT2/PORT1	If using port 2 to HP-UX (on some terminals)
REMOTE	On	Required
Resolution	512×390	Required for DGL, *Starbase* graphics
RETURN Def	$^{C}_{R}$	Required
RETURN=ENTER	No	Required
RR(CF)Recv	No	Cabling may require
SPOW [B]	No [Closed]	Strongly suggested
SR(CH)	Lo	Modem use may require
SRRInvert	No	Cabling may require
SRRXmit	No	Cabling may require
Start Column	1	Suggested (only affects MODIFY modes)
Stop Bits	1	Default for all speeds above 110 baud
STOP Function	Xon/Xoff	Suggested
StripNulDel	No	Suggested
Tab = Spaces	No	Required
Terminal Id	2622A	Suggested for 2392A
	2623A	Required for DGL on HP150 and 2393A
Terminal Mode	HP	Required by default *terminfo*
Transmit	All Fields	Suggested (only affects FORMAT mode)
Transmit indicator [Y]	Closed	Suggested
TR(CD)	Hi	Modem use may require
XmitFnctn [A]	No [Closed]	*vi* changes as needed
XmitPace	XonXoff	Suggested if softkeys or local RS-232 peripherals used

The following applies to 2640-series terminals only.

Terminal Feature	State	Comments
13260: 134	Open	Required
13260: 2SB	Open	Required above 110 baud (selects 1 stop bit)
13260: A4	Open	Required
13260: A9...A11	Closed	Required
13260: ATN2	Open	Required
13260: B0...B7	Don't Care	Enabled by CBE
13260: B8..B11	Don't Care	Enabled by CBE
13260: CBE	Open	Required (keyboard selects baud rate)
13260: FC0...FC7	All Open	Required
13260: IAT	Open	Unless THE/RHE used (terminal also used on HP1000)
13260: NOSB	Closed	Inhibit secondary carrier (SCF)
13260: S0...S2	Don't Care	Keyboard overrides
13260: THE, RHE	Open	Suggested: CD(DTR) hardware handshake disabled

HP Printer Command Language

The following is a condensed summary of HP-PCL. If a printer is PCL-compatible, this is noted in the "Specification Summary" in the following reference section of this appendix. This summary provides a rough idea of what capabilities exist at each PCL "level".

For detailed information, consult the technical reference manual for each printer. Most printers provide one or more features which exceed their PCL level.

Prerequisites to PCL

All levels of PCL imply the following basic printing capabilities:

- The ability to print at least 80 columns per line in normal pitch, and at least 132 columns per line in compressed pitch.
- The ability to print six lines per inch.
- Support of the ROMAN8 in at least the default and compressed print pitches.
- Horizontally connecting character cells (for solid underlining).
- Programmable features (such as underlining) remain active until specifically deactivated. (Some printers have a programmable "terminal" mode in which some features are deactivated at end-of-line.)
- At least single-overstrike is provided.
- Unsupported (e.g. higher level) PCL escape sequences are stripped (ignored, and not printed).
- The ability to print multiple pitches per line is not guaranteed at PCL level 1 and 2.

PCL Level 1 - Print and Space

Command	Function
$^{C}_{R}$	Carriage Return - move to left margin
$^{E}_{C}$	Escape - start a PCL command sequence
$^{F}_{F}$	Form Feed - advance to top of next page
$^{L}_{F}$	Line Feed - advance one line
$^{S}_{I}$	Shift In - change to alternate character set
$^{S}_{O}$	Shift Out - return to primary character set
$^{S}_{P}$	Space - advance right one character width
$^{E}_{C}$E	Hard reset - return to power-on state
$^{E}_{C}$Y	Turn on DISPLAY FUNCTIONS (if on)
$^{E}_{C}$Z	Turn off DISPLAY FUNCTIONS (if on)
$^{E}_{C}$z	Self test - perform self test
$^{E}_{C}$&d@	Turn off underlining mode
$^{E}_{C}$&dD	Turn on underlining mode
$^{E}_{C}$&k0S	Resume normal print pitch
$^{E}_{C}$&k2S	Switch to compressed print pitch
$^{E}_{C}$&l0L	Disable perforation-skip mode
$^{E}_{C}$&l1L	Enable perforation-skip mode
$^{E}_{C}$*rA	Prepare for raster data at left graphics margin
$^{E}_{C}$*b$\eta\eta\eta$W∂...∂	Print $\eta\eta\eta$ bytes of [∂...∂] raster data
$^{E}_{C}$*rB	Raster graphics complete

PCL Level 2 - EDP and Transaction Printing

Command	Function
$^{B}_{S}$	Back Space - move one character-width left
$^{E}_{C}$9	Clear all margins
$^{E}_{C}$&a$\eta\eta\eta$L	Set left margin in column $\eta\eta\eta$
$^{E}_{C}$&a$\eta\eta\eta$M	Set right margin in column $\eta\eta\eta$
$^{E}_{C}$&a$\eta\eta\eta$C	Move to absolute column $\eta\eta\eta$
$^{E}_{C}$&a$\eta\eta\eta$R	Move forward to absolute row $\eta\eta\eta$
$^{E}_{C}$&l6D	Print at 6 lines per inch
$^{E}_{C}$&l8D	Print at 8 lines per inch
$^{E}_{C}$&l$\eta\eta\eta$D	Set text length of page to $\eta\eta\eta$ lines
$^{E}_{C}$&l$\eta\eta\eta$P	Set abs. length of page to $\eta\eta\eta$ lines
$^{E}_{C}$($\eta\alpha$	Define set $\eta\alpha$ as primary character set
$^{E}_{C}$)$\eta\alpha$	Define set $\eta\alpha$ as secondary character set
$^{E}_{C}$(sϵH	Set primary font to pitch ϵ (may be floating point)
$^{E}_{C}$)sϵH	Set secondary font to pitch ϵ (may be floating point)
$^{E}_{C}$&p$\eta\eta\eta$X∂...∂	Print $\eta\eta\eta$ bytes of [∂...∂] transparent print data

PCL Level 3 - Document Processing

Command	Function
^{E}c&k$\eta\eta$H	Define character cell width in 1/120^{ths}-in.
^{E}c&l$\eta\eta$C	Define character cell height in 1/120^{ths}-in.
^{E}c&a$\pm\eta\eta\eta$H	Move $\pm\eta\eta\eta$ horizontal decipoints
^{E}c&a$\pm\eta\eta\eta$V	Move $\pm\eta\eta\eta$ vertical decipoints
^{E}c&aηR	Move -$\eta\eta$ vertical lines
^{E}c=	Forward half line feed
^{E}c(sηP	Primary font proportionally spaced
^{E}c)sηP	Secondary font proportionally spaced
^{E}c(sηS	Change primary font style to η
^{E}c)sηS	Change secondary font style to η 0 = upright, 1 = italic, 2 = slant
^{E}c(s$\pm\eta$B	Change primary font stroke weight to $\pm\eta$
^{E}c)s$\pm\eta$B	Change secondary font stroke weight to $\pm\eta$ <0 = light, 0 = medium, >0 = bold
^{E}c(s$\eta\eta$T	Change primary font typeface to $\eta\eta$
^{E}c)s$\eta\eta$T	Change secondary font typeface to $\eta\eta$ 0 = Line Printer, 1 = Pica, 2 = Elite, 3 = Courier, 4 = Helv, 5 = Tms Rmn, 6 = Gothic, 7 = Script, 8 = Prestige, 9 = Caslon, 10 = Orator
^{E}c(sηQ	Change primary font quality to η
^{E}c)sηQ	Change secondary font quality to η 0 = data processing, 1 = near letter quality, 2 = letter quality

PCL Level 4 - Page Formatting

No printers supporting level 4 had been introduced at publication time.

Native Language Support (NLS) Overview

Series 300 systems provide limited support for users whose native language is other than American English. The table on this page summarizes the native language support available in the Series 300 operating systems. The specific capabilities of each operating system are described in this appendix under: 97033A (HP-UX), 98613B (BASIC) and 98615C (Pascal). Two terms which are used frequently in this appendix are:

8-bit Transparent -identifies character set support. 8-bit transparent system facilities process text data containing characters in which all 8 data bits in each character code are significant. By way of comparison, the widely used (and HP-supported) USASCII character set is a 7-bit set.

All Series 300 computers and most HP peripherals provide the HP ROMAN8 or older Roman Extension sets, which contain characters required by most European languages. The ROMAN8 character table appears later in this appendix. All Series 300 computers provide a Japanese KANA8 set (which includes JASCII) as an alternative to the Roman sets.

Localized - identifies language support. Localized system facilities provide support such as error messages, collating and case-folding for one or specific languages (other than American English).

System Facility	BASIC 4.0	HP-UX 5.0	Pascal 3.1	SRM 2.1
Text/program editor	8-bit	8-bit	8-bit	NA
String data in programs	8-bit	8-bit	8-bit	NA
Symbolic names in programs	8-bit	8-bit	8-bit	NA
Text collating (sorting)	Localized	Localized	ASCII	NA
Case folding	Localized	Localized	None	NA
File names	8-bit	8-bit	8-bit	8-bit
File text data	8-bit	8-bit	8-bit	8-bit
Error messages	ASCII	Localized	ASCII	ASCII

Series 300 European Character Sets

For romance languages, all Series 300 video interfaces/keyboards and many HP peripherals support the Hewlett-Packard ROMAN8 character set. ROMAN8 is a full superset of U.S. ASCII and offers 88 additional native language symbols. Older HP peripherals may use the HP "Roman Extension" set, which is a subset of ROMAN8. Roman Extension is missing ROMAN8 characters À thru Ï, Ù, Û, Ç, ¥, ƒ, ¢, and Á thru ±.

ROMAN8 CHARACTER SET
(USASCII PLUS ROMAN EXTENSION)

b_8	b_7	b_6	b_5		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	NUL	DLE	SP	0	@	P	‘	p				¯	â	Å	Á	Þ
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q			À		ê	Î	Ã	þ
0	0	1	0	2	STX	DC2	"	2	B	R	b	r			Â		ô	ø	ã	
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s			È	°	û	Æ	Ð	
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t			Ê	Ç	á	å	ð	
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u			Ë	ç	é	í	Ì	
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v			Î	Ñ	ó	ø	Ì	¯
0	1	1	1	7	BEL	ETB	’	7	G	W	g	w			Ï	ñ	ú	æ	Ó	¼
1	0	0	0	8	BS	CAN	(	8	H	X	h	x			´	¡	à	Ä	Ò	½
1	0	0	1	9	HT	EM	)	9	I	Y	i	y			`	¿	è	ì	Ô	ª
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z			^	¤	ò	Ö	õ	º
1	0	1	1	11	VT	ESC	+	;	K	[	k	{			¨	£	ù	Ü	Š	«
1	1	0	0	12	FF	FS	,	<	L	\	l	|			~	¥	ä	É	š	■
1	1	0	1	13	CR	GS	-	=	M	]	m	}			Ù	§	ë	ï	Ú	»
1	1	1	0	14	SO	RS	.	>	N	^	n	~			Û	ƒ	ö	ß	Ÿ	±
1	1	1	1	15	SI	US	/	?	O	_	o	DEL			£	¢	ü	Ô	ÿ	■

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Japanese Character Sets

All Series 300 video interfaces/keyboards and many HP peripherals support an alternate 8-bit character set known as KANA8. The first 128 codes in the KANA8 set are JASCII (same as U.S. ASCII, except substitutes "¥" for "\") and the last 128 codes are Katakana (plus Roman Extension on the 98546A). The selection of KANA8 or ROMAN8 mode is determined by the first keyboard found (for bit-mapped displays) or by a switch (for the 98546A interface). It is not possible to switch between ROMAN8 and KANA8 modes on-line.

Blank

09800-12x00 Test Tools

09800-12x00 is a set of stand-alone programs used by HP Customer Engineers to test Series 200 and 300 systems. The product includes:

- One "Test Tools" manual.
- One each stand-alone Series 200 and 300 mainframe test system.
- A stand-alone CS/80 diagnostic/exerciser.
- A peripheral functional test program with Pascal environment.

09800-12x00/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
09800-12x00	Test Tools	Rev. A	Yes	Yes	NA	NA	NA

09800-12x00 Specification Summary

RAM required (total, stand-alone) Disc space used (as supplied)	512 Kbytes <1.3 Mbytes
Minimum configuration	CPU board, any console supported by any Series 300 operating system, HP-IB interface and supported 3½-in. or 5¼-in. disc (or an SRM interface if the Test Tools software is stored on an SRM system)

09800-12x00 Ordering Information

09800-12300	Test Tools, Software on 3½-in. flexible disc (single-sided format)
09800-12500	Test Tools, Software on 5¼-in. flexible disc (single-sided format)
09800-90001	Test Tools manual (half-size, w/binder, one included w/09800-12x00)

HP 110 *The Portable* Computer

Refer to product number 45710A.

13264A Data Link Adaptor

A 28mmH×120mmW×160mmD "pod" which converts Multipoint (MTS, HP Bisync) signals from RS-232C to HP Data Link (DSN/DL), a three-wire current-loop arrangement. Only the 98628A Datacomm interface has MTS/DL firmware which can communicate through the 13264A. The 13264A is powered by the 98628A. Early 98628A cards needed an Option (100) in order to support DSN/DL. This firmware is now standard on new 98628A cards. There are no plans to qualify the 13264A on any Series 300 computer.

The code in the BASIC and Pascal drivers which accesses the DSN/DL firmware of the 98628A card has not been changed from the earlier Series 200 versions which support Data Link. There are no plans to test this code with the Series 300. The DSN/DL feature of the 98628A has never been tested in HP-UX.

13265A 300 Baud Modem

A 28mmH×120mmW×160mmD "pod" which adds Bell 103/113 300 bps modem capability to most HP computers and peripherals which have 50-pin RS-232C connectors, such as the 98626A and 98628A interfaces. The 13265A is powered by its host. There are no plans to qualify the 13265A with any Series 300 computer.

The code in the BASIC and Pascal drivers which could access the 13265A via a 98626A or 98628A interface has not been changed from the earlier Series 200 versions which supported the 13265A. There are no plans to test this code with the Series 300. HP-UX has never been tested with the 13265A. The recommended (and supported) modem for 300 (and 1200) bps applications is the HP 92205A/C or HP 37212A.

13266A Current Loop Adaptor

A 28mmH×120mmW×160mmD "pod" which converts EIA RS-232C to 4-wire current loop on most HP computers and peripherals which have 50-pin RS-232C connectors, such as the 98626A and 98628A interfaces. The 13266A is powered by its host. There are no plans to qualify the 13266A with any Series 300 computer.

The code in the BASIC and Pascal drivers which could access the 13266A via a 98626A or 98628A interface has not been changed from the earlier Series 200 versions which supported the 13266A. There are no plans to test this code with the Series 300. HP-UX has never been tested with the 13266A.

13279B Color Video Monitor

The 13279B is a 19-in. (diagnonal) CRT monitor for use with the Series 200/300 98627A RGB graphics interface, the 97062A Series 500 graphics interface and the 97060A/T Series 500 graphics workstation. A 13279B is included in the 97060T product.

Option 035 (short persistance) is suggested with the 98627A interface unless otherwise recommended. The 13279B includes installation and adjustment by an HP Customer Engineer.

13279B/Series 300 Support Summary

Product	Description	Hardware Support 310	320
13279B	19-in. color monitor	Planned	Planned

Host computer boot ROM and software support of the 13279B monitor depends on the video interface used. Refer to 98627A in this appendix.

13279B Specification Summary

Data sheet (for complete specifications)	5953-5862
Dimensions	15.7-in.H, 18.97-in.W, 23.56-in.D
Weight	36.74 Kg
Phosphor, Option 035	P22
Phosphor, Option 065	A22
Interface	EIA RS-170 or RS-343
Scan rate	15-37 KHz interlaced or non-interlaced
Brightness	9.37 fl (P22), 13.07 fl (A22)
Resolution	1080 Horizontal × 809 Vertical
Pitch	0.31mm
AC voltage required	100, 117, 200, 234 Vac ±10%
AC frequency tolerance	50, 60 Hz ±10%
AC power required (typ., max.)	155, 170

13279B/Series 300 Interfacing

Refer to the 98627A discussion for interfacing information. The 13279B includes no video cables.

13279B Ordering Information

13279B	19-in. color monitor
Option 013	240 Vac 50 Hz operation
Option 014	100 Vac 60 Hz operation
Option 015	220 Vac 50 Hz operation
Option 016	100 Vac 50 Hz operation
Option 035	P22 Short persistence phosphor
Option 065	A22 Long persistence phosphor
13279-90001	13279B User Manual (full-size, one included w/13279B)
13279-90002	13279B Service Manual (full-size)
97064A	CAD worktable

14752A Computer-Aided Test Software

The 14752A Computer-Aided Test Software provides a set of utility programs and compiled subrprograms for use with the HP 6942A Multiprogrammer-II or HP 6944A Series 200 Multiprogrammer.

14752A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
14752A	CAT software	NA	Yes	Yes	4.0	No	No

14752A Specification Summary

RAM required (total)	1.0 Mbytes
Disc space used (as supplied)	<540 Kbytes
6942A interface required	Dedicated 98624A
6944A interface required	Dedicated 98633A
Single point data transfer rates	Input: 1.5ms, Output 1.4ms
Maximum DMA transfer rate	180 Kbytes/sec.
Block transfer overhead	Entry: 2.5ms, exit 0.2ms
Minimum interrupt response time	13.2ms

14752A/Series 300 BASIC Interfacing

Typical device specifier	18
Binaries required	GPIO, IO
Binaries optional	TRANS
Programming required	Extensive unless library used

14752A Ordering Information

14752A	Computer-Aided Test Software
Option 042	Software supplied on 5¼-in. flexible discs
Option 044	Software supplied on 3½-in. single-sided flexible discs
14752R	Manual set plus Right-to-copy 14752A once
	Application Notes (no charge)
5952-4072	AN 316-1 Buffered Analog-to-Digital Conversion
5952-4074	AN 316-2 Waveform Digitization
5952-4073	AN 316-3 High Speed FET Scanning
5952-4075	AN 316-4 Power Supply Programming
5952-90001	AN 316-5 Data Capture

HP 150 *Touchscreen* Computer

Refer to product number 45610A/B for the HP 150 "A" and "B".

Refer to product number 45850A for the *Touchscreen-II.*

17623A Graphics Tablet

An A-size electrostatic graphics tablet with digitzing stylus for use with 2623A and 2627A graphics terminals. The 17623A is user-installable.

17623A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
17623A	2623/27A tablet	NOP	Planned	Planned	No	5.0	No

17623A Specification Summary

Data sheet (for complete specifications)	5953-4145
Dimensions	38mmH, 467mmW, 367mmD
Weight (drive, as shipped)	3.62 kg, 6.8 kg
Interface	2623A or 2627A keyboard
Active digitzing area	295×217mm
Resolution	512×390 (DGL, *Starbase*) 2048×1560 (user programming)
Cursor tracking rate	30 points/sec.
Power required (from terminal)	5 W max.

17623A/Series 300 Interfacing

The 17623A interfaces to the system by intercepting the keyboard circuit of the 2623A or 2627A graphics terminal to which it is attached.

Early 2623A terminals require a power supply upgrade. Some existing 17623A tablets, 2623A terminals and 2627A terminals may also require a firmware upgrade for proper functioning. Refer to the DGL Handlers manual for information.

17623A/Series 300 HP-UX Interfacing

The driver/handler software and /dev file (*mknod*) are identical to the host terminal.

The resolution of the 17623A is limited to the resolution of the terminal (512×390) when used with the DGL or *Starbase* handler.

17623A Ordering Information

17623A	Graphics tablet
17623-90001	Operator's manual (full-size, one included w/17623A)
09111-68701	Stylus refills (2 inkless, 3 ink) (one set included w/17623A)
4114-0962	Platten overlay (one included w/17623A)
17623-90000	Service manual (full-size)

Blank

2225A *ThinkJet* Printer

A 150 cps dot-matrix HP-IB inkjet printer for 8½-in. wide paper. The *ThinkJet* is a good choice where quiet operation, low cost and/or very small size are criteria. The 2225A is user-installable.

2225A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2225A-AY	150 cps HP-IB *ThinkJet*	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2225A-AY	*ThinkJet* printer	Raster Dump	No	Raster Dump	Raster Dump

2225A Specification Summary

Data sheet (for complete specs.)	5953-9458
Dimensions	89mmH, 292mmW, 206mmD
Weight	3.36 kg
Interface and command set	HP-IB, PCL-1
Paper width	19.5...25.0cm (7.68...9.84-in.) single-sheet 22.0...22.9cm (8.66...9.02-in.) between feed holes
Print speed	150 cps, bidirectional, optimized path
Character cell	11×12
Print pitches (cpi)	6.0, 10.7, 12.0, 21.3
Line lengths (respectively)	40, 71, 80, 142
Line spacing (lpi)	6, 8
Character set	HP ROMAN8
Graphics density (dpi)	96×96, 192×96
AC voltage required	100, 120, 220, 240
AC frequency tolerance	47.5 to 63 Hz
AC power required (idle, max.)	1 VA, 8 VA

2225A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2225A	*ThinkJet* printer	1	0...30	1	N or H	0.0m	None

2225A/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 2225A.

2225A Switches	Sample Configuration
HP-IB address	1
SRQ	Off
LA (Listen Always)	Off

2225A/Series 300 BASIC Interfacing

Typical device specifier	`701`
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS supported	Yes

2225A/Series 300 HP-UX Interfacing

Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	`2225a`
DGL/*Starbase* handler	None

2225A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3**	**2**	**1**	**0**
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case Fold	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	1=Upper	1="NOCR"	1=RAW

Typical *mknod*s for 2225A at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

2225A/Series 300 HP-UX Considerations:

- The 2225A has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 2225A. If you have a built-in and a 98624A interface, use the 98624A for the 2225A. If possible, a dedicated 98624A is suggested.
- The 2225A can print graphics raster data supplied by the *dump_graphics.c* command.

2225A/Series 300 Pascal Interfacing

Default volume	`PRINTER: or #6`
Modules required	PRINTER
Modules optional	HPIB
Graphics dump supported	Yes

2225A Ordering Information

2225A	*ThinkJet* HP-IB Printer (U.S. version)
2225AB	*ThinkJet* HP-IB Printer (European version)
2225AK	*ThinkJet* HP-IB Printer (universal version, w/o power cord)
2225AQ	*ThinkJet* HP-IB Printer (Swiss version)
2225AU	*ThinkJet* HP-IB Printer (U.K. version)
2225AY	*ThinkJet* HP-IB Printer (Danish version)
2225AY	*ThinkJet* HP-IB Printer (Danish version)
92261A	*ThinkJet* printhead cartridge (one included w/2225)
02225-90031	Owner's Manual (half-size, one included w/2225)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
2225A+49A-00	Self-paced service training for 2225
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92171X	Acrylic printer stand for 35731/41 monitors and 2390-series terminals
92220R	0.3m right-angle HP-IB cable
92250V	Dust cover
92261B	Box of ten printhead cartridges
92261D	*ThinkJet* accessory kit (contains: 2-92261A, 1-92261S, 1 dust cover, 500 sheets fanfold and 500 cut sheets of paper)
92261M	Four packs of single-sheet ink-jet paper (200 sheet total)
92261N	Box of fan-fold ink-jet paper (2500 sheets)
92261S	Acrylic desktop printer stand

2225B *ThinkJet* Printer

This is the HP-IL version of the 2225A (HP-IB) *ThinkJet*. There are no plans to support the 2225B on any Series 300 system. If you own a 2225B (and an 82169A HP-IB/HP-IL converter), it may be possible to achieve some functionality with the 82169A (configured for translate mode) connected to the built-in or 98624A HP-IB interface and the 2225D connected to the 82169A.

2225D *ThinkJet* Printer

This is the RS-232C version of the 2225A (HP-IB) *ThinkJet*. There are presently no plans to support the 2225D on any Series 300 system. If you own a 2225D, it may be possible to achieve some functionality by starting with the configuration information for the 2686A *LaserJet*.

2334A *Multi-MUX* X.25 Cluster Controller

The 2334A is a communications adaptor which connects one-to-16 modem-capable RS-232C devices directly to a single X.25 PSN line. Series 300 HP-UX supports the 2334A as a method to obtain extremely reliable, high-speed *uucp* communications on domestic and international X.25 networks. The 2334A is supplied in a 19-in. rack-mountable enclosure.

2334A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2334A	X.25 Cluster controller	NA	Yes	Yes	Unsup.	5.0	Unsup.

2334A Specification Summary

Data sheet (for complete specifications)	5953-5963
Dimensions	135mmH, 425mmW, 540mmD
Weight (net, shipping)	13 kg, 17 kg
User interface	RS-232C, CCITT V.24/V.28
PSN interface	CCITT X.21 bis
User connect rates	110, 150, 300, 600, 1200, 2400, 9600 bps
PSN connect rates	1200 to 19200 bps
AC voltage required	86 to 127 Vac, 196 to 253 Vac
AC frequency tolerance	47.5 to 66 Hz
AC power required (typical)	115 Watts

2334A/Series 300 Interfacing

Although the 2334A can be hosted by any Series 300 RS-232C interface, the modem port of the 98642A Mux or the 98628A Datacomm interface are recommended. The example configuration assumes two 98628A at select codes 20 and 22 connected to ports 1 and 2 in slot A of the 2334A, and the 2334A connected to the U.S. Telenet network.

HP-UX Host Connection	Host-to-2334A cable	2334A ports		2334A-to-X.25 cable	X.25 PSN Connection
DTE(M)	DTE(M) implies	40261A port	HSA port	02333-60008 (included)	DCE

The following is a sample configuration for a 2334A connected to the U.S. Telenet network. The required value for most of these parameters will normally be supplied on a data sheet by the PSN carrier.

2334A Parameter	Sample Configuration	Comments
HSA LEVEL I		
Physical link	X.21bis DTE	Not selectable
Line speed	9600	
HSA LEVEL II		
Network type	TEL, 12	
Equipment type	LAP-B DTE	
Frame window	7	
Timer T1	3000	
Retry count N2	20	Not selectable
I-Frame	131	Not selectable
HSA LEVEL III		
Local address	_____	Portions assigned by X.25 carrier
Window size in	2	
Window size out	2	
Throughput in	9600	
Throughput out	9600	
Packet size in	128	
Packet size out	128	
First PVC	Default	
Last PVC	Default	
First SVC in	Default	
Last SVC in	Default	
First 2-way SVC	1	
Last 2-way SVC	64	
First SVC out	Default	
Last SVC out	Default	
First pool port	A1	
Last pool port	A1	
Negotiate packet size	No	
Negotiate window size	No	
Negotiate throughput	No	
Reverse charge accept	No	
D-bit	No	
Packet numbering	8	
UDP		
Profile number	2	define new profile (based on #1)
Set	11:12,0:13,14:2	set baud rate to 9600 set local modem control to "drop on clear"
ASG		
Port A1	a1:2	assign profile 2 to port A1
Port A2	a2:2	assign profile 2 to port A2

2334A/Series 300 HP-UX Interfacing

The 2334A has extensive configuration menus. It is strongly suggested that the first-time user order the 2334A with Option 100 to obtain initial configuration by HP personnel. Separate 2334A ports must be used for inbound and outbound connections. You can assign multiple inbound connections to a "pool" within the 2334A so that external callers need know about only one X.25 "local address" for your system, and will get any available port.

Driver required	"tty"
Block-mode major number	NA
Character-mode major number	1
Auto-dialer	ACUHP2334A

2334A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
	Select	98642A	Not	Access Type			
Fields	Code	port*	Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	00 to 03	0	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

The "98642A port" field is 0 for the built-in, 98626A, 98628A and 98644A RS-232C interfaces. Typical *mknod*s for 2334A at select codes 20 and 22.

```
# mknod /dev/x.25in  c 1 0x140000
# mknod /dev/x.25out c 1 0x160001
```

The 2334A is presently supported only with *uucp*. You may also use available ports for other applications, but the use of 2334A ports with *cu* or HP-UX login terminals (i.e. as a "stat mux") has not been tested.

2334A/Series 300 Pascal Interfacing

Although the 2334A (as a "stat mux") supports the 2392A terminal, the 98791B Pascal-based terminal emulator has not been tested with the 2334A.

There is no other Pascal software which transparently supports the 2334A or any other modem-like devices.

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* 98642A only, otherwise 0.

2334A Ordering Information

2334A	*Multi-MUX*
Option 100	Initial configuration by HP
Option 115	220 Vac operation
Option 122	Adds 40260A 4-port direct-connect interface
Option 123	Adds 40261A 4-port modem-connect interface (at least one Option 123/40261A required for HP-UX)
Option X25	X.25 manual
02333-60008	2334A to X.25 PSB cable (one included w/2334A)
02334-90001	2334A Reference and Service manual (full-size, one incl. w/2334A)
40260A	40260A 4-port direct-connect interface
40261A	40261A 4-port direct-connect interface
Option 001	Upgrades 40260A to 40261A
5061-0089	Front handles kit
5061-0077	Rack mounting kit
5061-0083	Rack mounting kit with front handles

2382A Alphanumeric Terminal

The 2382A is no longer supplied. It is a small-footprint CRT terminal similar in size to the 45610A/B HP 150 *Touchscreen* PC/Terminal. Although supported by (identical) HP-UX 5.0 software on Series 200 computers, there are no plans to qualify the 2382A on the Series 300. The recommended replacement for the 2382A is the 2392A.

2382A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2382A	Alphanumeric terminal	Rev. A	Unsup.	Unsup.	Unsup	5.0	Unsup

2392A Alphanumeric Terminal

The 2392A is a small-footprint alphanumeric CRT terminal with detached keyboard and adjustable 12-in. screen. It is the most economical terminal supported by Series 300 HP-UX. The 2392A is user-installable.

2392A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2392A	Alphanumeric terminal	Rev. A	Yes	Yes	Unsup.	5.0	Unsup.

2392A Specification Summary

Data sheet (for complete specifications)	5953-8612
Dimensions, monitor	317mmH, 325mmW, 362mmD
keyboard	35mmH, 455mmW, 220mmD
Weight	13 kg
CRT size (diagonal) and phosphor	30cm, P31 Green
Refresh rate (independent of AC line)	60 Hz
Screen capacity	27 lines × 80 columns lines 25..27 for labels and status
Softkeys	8, programmable
Keyboard(s)	46010A...AZ
Character set	HP ROMAN8[§], HP linedraw
Display enhancements	Inverse, underline, blinking, halfbright, and security in any combination
Other display features	Memory lock, smooth scrolling
Display memory	1.5 to 4 pages standard 3.5 to 8 pages optional
Interface, port 1	RS-232C/HP-422
port 2 (optional)	RS-232C[†] or Centronics
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200
Handshaking	Xon/Xoff, Enq/Ack, CTS, HP-DC1/DC2
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery backed
AC voltage required	115 or 230 Vac +10%, -25%, 47 to 66 Hz
AC power required	50 Watts

§ The 2392A is missing the last 32 characters (European) of the ROMAN8 set.

† The optional port is for local peripherals only and cannot be used as a second datacomm port to a host computer.

2392A/Series 300 Interfacing

The 2392A is compatible with all Series 300 RS-232C interfaces. The interface and interface cable (if any) may present one of several connection styles. Refer to the interface card discussions for information about the interface side of the connection. The 2392A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	40242M	2392A port 1
DIR25(F)	40242G	2392A port 1
DIR25(M)	40242C	2392A port 1

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2392A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	`tty`
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2392, 2392a, hp2392a`

A 98642A or 98628A interface are recommended if a 98625A interface is also present in the system. These interfaces are also recommended if you will be using softkeys or reading terminal status at rates above 4800 baud.

2392A Ordering Information

2392A	Display Terminal, 115 Vac, ASCII keyboard
Option 015	230 Vac, 50 Hz operation
Option 049	Add ANSI operation
Option 092	Adds 40210R RS-232C port 2 card
Option 093	Adds 40210P Centronics port 2 card
Option 101	Substitutes Swedish keyboard
Option 102	Substitutes Norwegian keyboard
Option 103	Substitutes French AZERTY keyboard
Option 104	Substitutes German keyboard
Option 105	Substitutes United Kingdom keyboard
Option 106	Substitutes Spanish keyboard
Option 107	Substitutes Canadian-French keyboard
Option 108	Substitutes Canadian-English keyboard
Option 109	Substitutes Italian keyboard
Option 110	Substitutes Dutch keyboard
Option 111	Substitutes Finnish keyboard
Option 112	Substitutes Danish keyboard
Option 113	Substitutes Swiss-German keyboard
Option 114	Substitutes Swiss-French keyboard
Option 115	Substitutes Latin Spanish keyboard
Option 116	Substitutes Flemish keyboard
Option 160	Adds 3 to 4 pages of display memory
Option 301	Adds 40242M U.S. modem cable
Option 302	Adds 40242M European modem cable

2392A Ordering Information, continued...

02390-90001	2392 Reference Manual
02390-90002	2392 User Manual (one included w/2392A)
40210R	RS-232C (25-pin female) interface for port 2
40210P	Centronics interface for port 2
40242D	Centronics "Printer" cable for port 2
40242G	RS-232C (25-pin male-to-male) "Printer" cable for port 2 (also a datacomm cable to DIR25(F) host)
40242M	U.S./European 25-pin male-to-male modem cable
5180-6304	2390-series manual binder (one included w/2392A)

2393A Monochromatic Graphics Terminal

The 2393A is a modular monochromatic graphics terminal with detached keyboard and detached 12-in. CRT monitor. It uses the same HP-HIL keyboards (46020A-series) and 12-in. monochrome display (35731-series) as the Series 300 computers. The terminal controller is a 4-unit high *Design Plus* enclosure. The 2393A supports (locally) many of the same HP-HIL peripherals as the Series 300 computers. It is the most economical external graphics terminal supported by HP-UX systems. The 2393A is user-installable.

2393A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2393A	Graphics terminal	Rev. A	Yes	Yes	Unsup.	5.0	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2393A	Graphics terminal	Yes	Yes	No	as 2623A	as 2623A	No

2393A Specification Summary

Data sheet (for complete specs.)	5953-8617
Dimensions, processor	100mmH, 325mmW, 325mmD
Dimensions, monitor and keyboard	<refer to 35731 and 46020A>
Weight	16.3 kg
CRT characteristics	<refer to 35731>
Refresh rate (independent of AC line)	60 Hz
Screen capacity	27 lines × 80 columns lines 25..27 for labels and status
Graphics resolution	512×390, 640×400
Softkeys	12, programmable
Keyboard	46020A...AZ
Character sets	HP ROMAN8, HP linedraw, math, italic, bold
Display enhancements	Inverse, underline, blinking, halfbright, double-high, double-wide and security in any combination
Other display features	Memory lock, smooth scrolling
Display memory	12 pages standard
Command sets	HP, ANSI, VT52®, TEK®4010/4014
Interface, port 1	RS-232C/HP-422
port 2 (optional)	RS-232C†, HP-IB or Centronics
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200
Handshaking	Xon/Xoff, Enq/Ack, HP-DC1/DC2, DTR, CTS, SRR, DSR
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery backed
AC voltage required	115 or 230 Vac +10%, -25%, 47 to 66 Hz
AC power required (max.)	95 Watts (TPU is 50, CRT is 45)

2393A/Series 300 Interfacing

The 2393A is compatible with all Series 300 RS-232C interfaces as an alphanumeric terminal, but the buffered 98642A and 98628A are recommended for DGL and *Starbase* graphics. Refer to the interface card discussions for information about the interface side of the connection. The 2393A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	40242M	2393A port 1
DIR25(F)	40242G	2393A port 1
DIR25(M)	40242C	2393A port 1

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2393A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required (alpha, graphics)	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Interface required (graphics)	98642A or 98628A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2393, 2393a, hp2393a`
DGL handlers	`A0001, B0001, D0019, K0001, L0019, P0019, V0019` (supported as 2623A emulator only)
Starbase handler	`/usr/lib/libdd262x.a` (supported as 2623A emulator only)

2393A/Series 300 HP-UX Considerations:

- A 98642A or 98628A interface is recommended if a 98625A interface is also present in the system.
- The resolution of information entered via HP-HIL devices (such as digitizers) is presently limited by DGL and *Starbase* graphics to the screen resolution (512×390).
- The 2393A may work as a graphics output device with the single-byte buffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.
- Raster graphics printing is supported to a terminal-interfaced printer only. A user-written program may be able to read back the screen contents for raster printing on a system printer.

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† The optional port may be used for local peripherals or as a second datacomm port to a host computer.

VT52 is a registered trademark of Digital Equipment Corp.

TEK is a registered trademark of TEKTRONIX, Inc.

2393A Ordering Information

2393A	Graphics Terminal, 115 Vac, ASCII keyboard
Option 015	Substitutes 35721BK monitor (no power cord)
Option 046	Adds 40210H HP-IB port
Option 049	ANSI operation
Option 060	Delete 35731 monitor
Option 092	Adds 40210R RS-232C port 2 card
Option 093	Adds 40210P Centronics port 2 card
Option 101	Substitutes Swedish keyboard
Option 102	Substitutes Norwegian keyboard
Option 103	Substitutes French AZERTY keyboard
Option 104	Substitutes German keyboard
Option 105	Substitutes United Kingdom keyboard
Option 106	Substitutes Spanish keyboard
Option 107	Substitutes Canadian-French keyboard
Option 108	Substitutes Canadian-English keyboard
Option 109	Substitutes Italian keyboard
Option 110	Substitutes Dutch keyboard
Option 111	Substitutes Finnish keyboard
Option 112	Substitutes Danish keyboard
Option 113	Substitutes Swiss-German keyboard
Option 114	Substitutes Swiss-French keyboard
Option 115	Substitutes Latin Spanish keyboard
Option 116	Substitutes Flemish keyboard
Option 301	Adds 40242M U.S. modem cable
Option 302	Adds 40242M European modem cable
35751M	Terminal processor unit (TPU) only
5180-6307	Manual binder (one included w/2393A)
02393-90001	2393 User's Manual (one included w/2393A)
02393-90002	2393 Reference Manual (one included w/2393A)
02393-90003	2393 Service Manual
35723A	HP-HIL *HP Touch* bezel
40210H	HP-IB interface for port 2
40210R	RS-232C (25-pin female) interface for port 2
40210P	Centronics interface for port 2
40242D	Centronics "Printer" cable for port 2
40242G	RS-232C (25-pin male-to-male) "Printer" cable for port 2 (also a datacomm cable to DIR host)
40242M	U.S./European 25-pin male-to-male modem cable
40242V	0.4m composite video cable (one included w/2393A)
46060A	HP Mouse (2-button)
46080A	HP-HIL 2.4m extension (no audio)
46081A	HP-HIL 2.4m extension (w/audio, not used by 2393A)
46083A	HP-HIL knob
46087A	HP-HIL A-size digitizer
Option 001	Adds 46089A 4-button cursor
46088A	HP-HIL B-size digitizer
Option 001	Adds 46089A 4-button cursor
46089A	4-button cursor for 46087/88A
92916A	HP-HIL bar code reader

2397A Monochromatic Graphics Terminal

The 2397A is a modular color graphics terminal with detached keyboard and detached 12-in. CRT monitor. It uses the same HP-HIL keyboards (46020A-series) and 12-in. color display (35741-series) as the Series 300 computers. The terminal controller is a 4-unit high *Design Plus* enclosure. The 2397A supports (locally) many of the same HP-HIL peripherals as the Series 300 computers. It is the most economical external color graphics terminal supported by HP-UX systems. The 2397A is user-installable.

2397A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2397A	Color graphics terminal	Rev. A	Planned	Planned	Unsup.	5.0	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2397A	Graphics terminal	Planned	Planned	No	as 2623A	as 2623A	No

2397A Specification Summary

Data sheet (for complete specs.)	5953-8624
Dimensions, processor	100mmH, 325mmW, 325mmD
Dimensions, monitor and keyboard	<refer to 35741 and 46020A>
Weight	16.3 kg
CRT characteristics	<refer to 35741>
Colors	8 pairs of 64 pairs
Refresh rate (independent of AC line)	60 Hz
Screen capacity	27 lines × 80 columns lines 25..27 for labels and status
Graphics resolution	512×390×3, 640×400×3
Softkeys	12, programmable
Keyboard	46020A...AZ
Character sets	HP ROMAN8, HP linedraw, math, italic, bold
Display enhancements	Inverse, underline, blinking, halfbright, double-high, double-wide and security in any combination
Other display features	Memory lock, smooth scrolling
Display memory	12 pages standard
Command sets	HP, ANSI, VT52®, TEK®4010/4014
Interface, port 1	RS-232C/HP-422
port 2 (optional)	RS-232C†, HP-IB or Centronics®
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200
Handshaking	Xon/Xoff, Enq/Ack, HP-DC1/DC2, DTR, CTS, SRR, DSR
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery backed
AC voltage required	110 to 120 Vac ±10%, 47 to 66 Hz 200 to 240 Vac ±10%, 47 to 66 Hz
AC power required (max.)	115 Watts (TPU is 50, CRT is 65)

2397A/Series 300 Interfacing

The 2397A is compatible with all Series 300 RS-232C interfaces as an alphanumeric terminal, but the buffered 98642A and 98628A are recommended for DGL and *Starbase* graphics. Refer to the interface card discussions for information about the interface side of the connection. The 2397A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	40242M	2397A port 1
DIR25(F)	40242G	2397A port 1
DIR25(M)	40242C	2397A port 1

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2397A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required (alpha, graphics)	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Interface required (graphics)	98642A or 98628A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2627, 2397, 2397a, hp2397a`
DGL handlers	`A0001, B0001, D0036, K0001, L0019, P0019, V0019` (supported as 2627A emulator only)
Starbase handler	`/usr/lib/libdd262x.a` (supported as 2627A emulator only)

2397A/Series 300 HP-UX Considerations:

- A 98642A or 98628A interface is recommended if a 98625A interface is also present in the system.
- The resolution of information entered via HP-HIL devices (such as digitizers) is presently limited by DGL and *Starbase* graphics to the screen resolution (512×390).
- The 2397A may work as a graphics output device with the single-byte buffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.
- Raster graphics printing is supported to a terminal-interfaced printer only. A user-written program may be able to read back the screen contents for raster printing on a system printer.

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† The optional port may be used for local peripherals or as a second datacomm port to a host computer.

VT52 is a registered trademark of Digital Equipment Corp.

TEK is a registered trademark of TEKTRONIX, Inc.

Centronics is a registered trademark of Centronics Data Computer Corp.

2397A Ordering Information

2397A	Color graphics Terminal, ASCII keyboard
Option 015	Substitutes 35721BK monitor (no power cord)
Option 046	Adds 40210H HP-IB port
Option 049	ANSI operation
Option 060	Delete 35731 monitor
Option 092	Adds 40210R RS-232C port 2 card
Option 093	Adds 40210P Centronics® port 2 card
Option 101	Substitutes Swedish keyboard
Option 102	Substitutes Norwegian keyboard
Option 103	Substitutes French AZERTY keyboard
Option 104	Substitutes German keyboard
Option 105	Substitutes United Kingdom keyboard
Option 106	Substitutes Spanish keyboard
Option 107	Substitutes Canadian-French keyboard
Option 108	Substitutes Canadian-English keyboard
Option 109	Substitutes Italian keyboard
Option 110	Substitutes Dutch keyboard
Option 111	Substitutes Finnish keyboard
Option 112	Substitutes Danish keyboard
Option 113	Substitutes Swiss-German keyboard
Option 114	Substitutes Swiss-French keyboard
Option 115	Substitutes Latin Spanish keyboard
Option 116	Substitutes Flemish keyboard
Option 301	Adds 40242M U.S. modem cable
Option 302	Adds 40242M European modem cable
35751C	Terminal processor unit (TPU) only
5180-6307	Manual binder (one included w/2397A)
02397-90001	2397 User's Manual (one included w/2397A)
02397-90002	2397 Reference Manual (one included w/2397A)
02397-90003	2397 Service Manual
35723A	HP-HIL *HP Touch* bezel
40210H	HP-IB interface for port 2
40210R	RS-232C (25-pin female) interface for port 2
40210P	Centronics® interface for port 2
40242D	Centronics® "Printer" cable for port 2
40242G	RS-232C (25-pin male-to-male) "Printer" cable for port 2 (also a datacomm cable to DIR host)
40242M	U.S./European 25-pin male-to-male modem cable
40242V	0.4m composite video cable (one included w/2397A)
46060A	HP Mouse (2-button)
46080A	HP-HIL 2.4m extension (no audio)
46081A	HP-HIL 2.4m extension (w/audio, not used by 2397A)
46083A	HP-HIL knob
46087A	HP-HIL A-size digitizer
Option 001	Adds 46089A 4-button cursor
46088A	HP-HIL B-size digitizer
Option 001	Adds 46089A 4-button cursor
46089A	4-button cursor for 46087/88A
92916A	HP-HIL bar code reader

2563A 300 lpm Printer

The 2563A is a 300 line per minute dot-matrix impact printer for fan-fold single- or multi-part paper in widths up to 16.75-in. wide. With the optional stand and passive paper stacker, the 2563A is a good choice for medium volume "listing"-quality printing. The 2563A includes installation by an HP Customer Engineer.

2563A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2563A	300 lpm impact printer						
Option 200	Non-CIPER HP-IB interface	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 850	CIPER HP-IB interface	Rev. A	Yes	Yes	No	5.0	No

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2563A	300 lpm printer	Yes	Yes	Raster Dump	Unsup. Unsup.	Raster Dump	Raster Dump

2563A Specification Summary

Data sheet (for complete specifications)	5953-7140U, 5953-9463
Dimensions (without stand)	274mmH, 600mmW, 450mmD
Dimensions (with stand)	994mmH, 600mmW, 755mmD
Weight (without, with stand)	34 kg, 61 kg
Interface and command set	HP-IB, PCL-2
Paper width (min., max.)	3, 16.75in.
Print speed, slew rate	300 lpm, 14 ips
Character cell	5 (of 13) × 9 and 7 (of 19) × 18
Print pitches (cpi)	5, 10, 16.7
Line lengths (respectively)	66, 132, 220
Line spacing (lpi)	6, 8
Character sets	HP ROMAN8, KANA8, OCR, Block, Barcode
Graphics density (dpi)	70×72
AC voltage required	100, 120, 220, 240 +5 -10%, 50/60 Hz
AC power required (idle, typ., max.)	200 W, 230 W, 600 VA

2563A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2563A	300 lpm impact printer						
Option 200	Non-CIPER HP-IB i/f	1	0...7	1...7	N or H	0.0m	4.0m
Option 850	CIPER HP-IB i/f	1	0...7	1...7	N or H	0.0m	4.0m

2563A/Series 300 Interfacing

The interface Option (200 or 850) specified determines the interface and default configuration of the printer. All current 2563As may be re-configured in the field from their operator control panels. Early 2563As require that a "CE" jumper be grounded on the HP-IB interface inside the printer in order to change certain configuration registers. This should only be attempted by properly equipped, qualified service personnel who have a service manual.

Any Series 300 HP-IB interface may be used for the 2563A Option 850 (CIPER) in HP-UX. Only the built-in HP-IB or 98624A support simple printers such as the 2563A Option 200 (non-CIPER). The examples which follow assume that the 2563A is at bus address 1 on the built-in interface (select code 7).

The sample configurations for Options 200 and 850 are as follows:

Function Number	Function Name	Option 200	Option 850 (also 290)
1	Primary character set	0	0
2	Secondary character set	4	4
3	Print density	0	0
4	Print pitch	10.0	10.0
20	HP-IB address	1	1
21..24		0	0
25, 26, 27	Protocol	2, 19, 83	0, 0, 0

The RS-232C interfaced version of the 2563A has not been tested in any Series 300 configuration.

2563A/Series 300 BASIC Interfacing

Required configuration	HP-IB non-CIPER
Typical device specifier	`701`
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS	Supported

2563A/Series 300 HP-UX Interfacing

Drivers required (CIPER)	`ciper`
Drivers required (non-CIPER)	`printer`
Block-mode major number	NA
Character-mode major number (CIPER)	26
Character-mode major number (non-CIPER)	7
Spooler model file	`dumb`
DGL/*Starbase* handler	None

2563A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case-Fold	Over-print	Cooked vs Raw
CIPER (hex)	07 to 1E	00 to 07	0	1=NO-EJECT	0	0	1=RAW
Non-CIPER (hex)	07 to 1E	00 to 07	0	1=NO-EJECT	1=UPPER	1="NOCR"	1=RAW

Typical *mknod*s for 2563A Option 850 at select code 7, bus address 1

```
# mknod /dev/lp  c 26 0x070100
# mknod /dev/rlp c 26 0x070101
```

2563A/Series 300 HP-UX considerations:

- The 2563A Option 200 (non-CIPER) has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 2563A#200. If you have a built-in and a 98624A interface, use the 98624A for the 2563A#200. If possible, a dedicated 98624A is suggested.
- The 2563A may print graphics raster data supplied by the *dump_graphics.c* command. It may also print raster data supplied by the 2934A DGL handler (if the spooling bit is set), although this is not supported.

2563A/Series 300 Pascal Interfacing

Configuration required	HP-IB non-CIPER
Default volume	PRINTER: or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump (raster printing)	Yes

2563A Ordering Information

2563A	Line Printer, 120 Vac, 60 Hz
	ROMAN8 character set and raster graphics are standard
	Option 200 or Option 850 is required
Option 001	Adds Linedraw, math and block characters (included in Option 500)
Option 002	Replaces ROMAN8 with KANA8 character set
	2563A supports a maximum of 4 high-density sets
Option 003	Adds high-density OCR character sets
Option 004	Adds high-density ROMAN8 (included in Option 500)
Option 005	Adds high-density ROMAN8 italic (included in Option 500)
Option 006	Adds high-density KANA8
Option 007	Adds 3 of 9, interleaved 2 of 5 and industrial 2 of 5 bar code character sets
Option 008	Adds Option 007 plus UPC/EAN bar codes
Option 015	220 Vac, 50/60 Hz operation
Option 016	100 Vac, 50/60 Hz operation
Option 017	240 Vac, 50/60 Hz operation
Option 049	RS-232C interface in printer (not supported)
Option 068	92158A Ribbon starter pack (Included in Option 500)
Option 110	26764A Sound abatement cover (Included in Option 500)
Option 112	92214P Printer stand (Included in Option 500)
Option 115	26763A Passive paper stacker
Option 200	HP-IB interface in printer, configured for non-CIPER
Option 500	Options bundle, includes Opts. 001, 004, 005, 068, 110, 112
Option 715	Service documentation
Option 850	HP-IB interface in printer, configured for CIPER

2563A Accessories Ordering Information
(refer to the Computer User's Catalog {5953-2450} for additional supplies)

02563-90032	Block character set manual (included w/Option 001)
02563-90901	Operator's Manual (one included w/2563A)
02563-90902	Condensed Operator's Manual (one included w/2563A)
02563-90904	Service Manual (one included Option 715)
02563-90905	Technical Reference Manual (one included w/2563A)
02563-90906	Parts and Diagrams Manual (one included w/Option 715)
02563-90907	Pocket Guide (one included w/2563A)
26067-90901	HP-IB interface manual (one included with any HP-IB Option)
26067-90903	RS-232C interface manual (one included with RS-232C Option)
26067A	Interface conversion kits (order only one option)
Option 001	HP-IB interface
Option 003	RS-232C interface (not supported)
26761A	Character set upgrade - specify one or more options
Option 001	Linedraw, math and block characters
Option 002	KANA8 character set
Option 003	High-density OCR character sets
Option 004	High-density ROMAN8
Option 005	High-density ROMAN8 italic
Option 006	High-density KANA8
Option 007	Bar code character sets
Option 008	Option 007 plus UPC/EAN bar codes
26763A	Passive paper stacker
26764A	Sound abatement cover
92157B	8½×11-in. paper, 3-hole punched (box of 3200 sheets)
92158A	Printer ribbons (box of 3) (one ribbon included w/2563A)
92158M	OCR (and bar code) printer ribbons (box of 3)
92214P	*Design-Plus*-compatible printer stand

2565A 600 lpm Printer

The 2565A is identical to the 2566A except that the print speed of the 2565A is 600 lpm vs 900 lpm for the 2566A. All other specifications, interfacing, support and considerations are the same.

2566A 900 lpm Printer

The 2566A is a 900 line per minute dot-matrix impact printer for fan-fold single- or multi-part paper in widths up to 18-in. wide. With the optional passive paper stacker, the 2566A is a good choice for high volume "listing"-quality printing. The 2566A is supplied in a tall cabinet and requires no stand. The 2566A includes installation by an HP Customer Engineer.

2566A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2566A	900 lpm impact printer						
Option 200	Non-CIPER HP-IB interface	Rev. A	Planned	Planned	4.0	5.0	3.1
Option 850	CIPER HP-IB interface	Rev. A	Planned	Planned	No	5.0	No

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2566A	900 lpm printer	Yes	Yes	Raster Dump	Unsup. Unsup.	Raster Dump	Raster Dump

2566A Specification Summary

Data sheet (for complete specifications)	5953-0751
Dimensions	110cmH, 98.3cmW, 63.5cmD
Weight	204 kg
Interface and command set	HP-IB, PCL-2
Paper width (min., max.)	3.0, 18.0 in.
Print speed, slew rate	900 lpm, 25 ips
Character cell	5 (of 13) × 9 and 7 (of 19) × 18
Print pitches (cpi)	5, 10, 16.7
Line lengths (respectively)	66, 132, 220
Line spacing (lpi)	6, 8
Character sets	HP ROMAN8, KANA8, OCR, Block, Barcode, Arabic8
Graphics density (dpi)	70H×72V
Paper weights	15# to 100# (single-part) 6 copies max. (12#, 5×7#)
AC voltage required	100, 120, 220, 240 +5 -10%
AC frequency tolerance	48 to 66 Hz
AC power required (idle, typ. max.)	150 W, 400 W, 550 VA

2566A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2566A	900 lpm impact printer						
Option 200	Non-CIPER HP-IB interface	1	0...7	1...7	N or H	0.0m	4.0m
Option 850	CIPER HP-IB interface	1	0...7	1...7	N or H	0.0m	4.0m

2566A/Series 300 Interfacing

The interface Option (200 or 850) specified determines the interface and default configuration of the printer. 2566As may be re-configured in the field from their operator control panels.

Any Series 300 HP-IB interface may be used for the 2566A Option 850 (CIPER) in HP-UX. Only the built-in HP-IB or 98624A support simple printers such as the 2566A Option 200 (non-CIPER). The examples which follow assume that the 2566A is at bus address 1 on the built-in interface (select code 7).

The sample configurations for Options 200 and 850 are as follows:

Function Number	Function Name	Option 200	Option 850 (also 290)
1	Primary character set	0	0
2	Secondary character set	4	4
3	Print density	0	0
4	Print pitch	10.0	10.0
20	HP-IB address	1	1
21..24		0	0
25, 26, 27	Protocol	2, 19, 83	0, 0, 0

The RS-232C interfaced version of the 2566A has not been tested in any Series 300 configuration.

2566A/Series 300 BASIC Interfacing

Required configuration	HP-IB non-CIPER
Typical device specifier	`701`
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS	Supported

2566A/Series 300 HP-UX Interfacing

Drivers required (CIPER)	`ciper`
Drivers required (non-CIPER)	`printer`
Block-mode major number	NA
Character-mode major number (CIPER)	26
Character-mode major number (non-CIPER)	7
Spooler model file	`dumb`
DGL/*Starbase* handler	None

2566A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case-Fold	Over-print	Cooked vs Raw
CIPER (hex)	07 to 1F	00 to 07	0	1=NO-EJECT	0	0	1=RAW
Non-CIPER (hex)	07 to 1F	00 to 07	0	1=NO-EJECT	1=UPPER	1="NOCR"	1=RAW

Typical *mknod*s for 2566A Option 850 at select code 7, bus address 1

```
# mknod /dev/lp  c 26 0x070100
# mknod /dev/rlp c 26 0x070100
```

2566A/Series 300 HP-UX considerations:

- The 2566A Option 200 (non-CIPER) has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 2566A#200. If you have a built-in and a 98624A interface, use the 98624A for the 2566A#200. If possible, a dedicated 98624A is suggested.
- The 2566A can print graphics raster data supplied by the *dump_graphics.c* command. It can also print raster data supplied by the 2934A DGL handler (if the spooling bit is set), although this is not supported.

2566A/Series 300 Pascal Interfacing

Configuration required	HP-IB non-CIPER
Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump (raster printing)	Yes

2566A Ordering Information

2566A	600 lpm Line Printer, 120 Vac, 60 Hz
	ROMAN8 character set and raster graphics are standard
	Option 200 or Option 850 is required
Option 001	Adds Linedraw, math and block characters (included in Option 500)
Option 002	Replaces ROMAN8 with KANA8 character set
	2566A supports a maximum of 4 high-density sets
Option 003	Adds high-density OCR character sets
Option 004	Adds high-density ROMAN8 (included in Option 500)
Option 005	Adds high-density ROMAN8 italic (included in Option 500)
Option 006	Adds high-density KANA8
Option 008	Adds high-density 3 of 9, interleaved 2 of 5, industrial 2 of 5, UPC and EAN bar codes
Option 010	Adds standard- and high-density Arabic8 & linedraw Requires Option 028 and counts as two sets
Option 015	220 Vac, 50/60 Hz operation
Option 016	100 Vac, 50/60 Hz operation
Option 017	240 Vac, 50/60 Hz operation
Option 022	Adds 128 Kbytes VDM vector graphics (not supported)
Option 023	Adds 512 Kbytes VDM vector graphics (not supported)
Option 028	Extended language support
Option 049	RS-232C interface in printer (not supported)
Option 115	26763B Passive paper stacker (Included in Option 500)
Option 200	HP-IB interface in printer, configured for non-CIPER
Option 500	Options bundle, includes Opts. 001, 004, 005, 115
Option 715	Service documentation
Option 850	HP-IB interface in printer, configured for CIPER

2566A Accessories Ordering Information
(refer to the Computer User's Catalog {5953-2450} for additional supplies)

02563-90032	Block character set manual (included w/Option 001)
02566-90901	Operator's Manual (one included w/2566A)
02566-90902	Condensed Operator's Manual (one included w/2566A)
02566-90904	Service Manual (one included w/Option 715)
02566-90905	Technical Reference manual (one included w/2566A)
02566-90906	Parts and Diagrams Manual (one included w/Option 715)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
26067-90901	HP-IB interface manual (one included w/HP-IB Option(s))
26067-90903	RS-232C interface manual (one included w/RS-232C Option)
26060B	Extended support
Option 028	Contextual analysis for Arabic8
26061A	VDM vector graphics processor
Option 022	128 Kbytes
Option 023	512 Kbytes
26067B	Interface conversion kits (order only one option)
Option 001	HP-IB interface
Option 003	RS-232C interface (not supported)
26761B	Character set upgrade - specify one or more options
Option 001	Linedraw, math and block characters
Option 002	KANA8 character set
Option 003	High-density OCR character sets
Option 004	High-density ROMAN8
Option 005	High-density ROMAN8 italic
Option 006	High-density KANA8
Option 008	High-density bar codes
Option 010	High-density Arabic8 and linedraw Requires 2566A Option 028 or 26060B Option 028)
26763B	Passive paper stacker
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92157B	8½×11-in. paper, 3-hole punched (box of 3200 sheets)
9282-0545	Ribbon (one roll) (one ribbon included w/2566A)

2601A Daisywheel Printer

A 40 cps RS-232C daisywheel printer for up to 15.2-in. wide paper. The 2601A is a good choice where impact printing (e.g. multiple-part forms) or unusual (e.g. non *LaserJet*-compatible) media are required.

2601A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2601A	40 cps daisywheel printer						
Option 826	for use with HP 9000	NA	Planned	Planned	4.0	5.0	3.1
26010A	Forms tractor	NA	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
26010D	Sheet feeder	NA	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

2601A Specification Summary

Data sheet (for complete specifications)	5953-6279
Dimensions	249mmH, 618mmW, 469mmD
Weight	29 kg
Interface and command set	RS-232C, Diablo 630
Paper width (min., max.)	84mm, 387mm., fan-fold or sheet
Print speed	40 cps, bidirectional 32 cps with metallized print wheels
Print pitches (cpi)	Variable @ 1/120-in. increments
Line spacing (lpi)	Variable @ 1/48-in. increments
Character set	96 character printwheels
Graphics density (dpi)	NA
Data rates (baud)	110, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600
Handshaking	Xon/Xoff, Etx/Ack, DTR
Character frame	7 bits, parity odd, even or none
Configuration	internal switches
AC voltage required	100, 120, 220, 240 +10/-15%
AC frequency tolerance	49 to 61 Hz
AC power required (ave., max.)	130W, 180W

2601A/Series 300 Interfacing

The 2601A may be used with any Series 300 RS-232C interface at 300 baud. At speeds above 300 baud, some kind of flow control (pacing) is required. See each operating system section for details. The examples which follow assume that the 2601A is connected to an interface at select code 9.

The suggested interface is any RS-232C interface cabled to provide a DTE connection, such as the built-in interface with 13242N or 92221M cable. The interface should be configured (if possible) for 1200 baud, 8 bits/character, no parity, Xon/Xoff handshake, modem status lines (DSB & CTS) connected.

Host Connection	Peripheral Cable	Peripheral	Comments
DTE(M)	17255D	2601A	All configurations
DCE(F)	Included w/2601A	2601A	HP-UX only
DIR9(F)	92221P	2601A	HP-UX only
DIR25(F)	13242G	2601A	HP-UX only
DIR25(M)	None	2601A	HP-UX only

WARNING

BE SURE TO DISCONNECT THE POWER CORD FROM THE 2601A WHENEVER YOU ARE WORKING WITH THE HPR05 BOARD. LETHAL VOLTAGES ARE EXPOSED WHENEVER THE CASE PARTS ARE REMOVED FROM THE 2601A AND THE LINE CORD IS CONNECTED.

Sample 2601A switch settings	Full duplex, parity disabled, 1200 baud
Sample 2601A jumpers	HPR05: A60 5&6 in

2601A/Series 300 BASIC Interfacing

Typical device specifier	9
Binaries required	SERIAL or DCOMM
Binaries optional	IO
Programming required	`CONTROL 9,3;1200` (on 98644A or built-in RS232) `PRINTER IS 9` (all configurations)
DUMP GRAPHICS supported	No

2601A/Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1
Spooler model file	modify: `2686a`
DGL/*Starbase* handler	None

2601A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	Not Used	Port*	Line Type
Values (hex)	07 to 1F	0	0 to 3*	4

Typical *mknod* for 2601A at select code 9

```
# mknod /dev/lp2601  c 1 0x090004
```

* For 98642A Mux ports only, otherwise zero (0).

2601A/Series 300 HP-UX Considerations:

- If you prefer not to use a modified 2686A spooler model, you can insert the following shell commands in */etc/rc*. This will properly configure the RS-232 interface for unspooled printing.

```
nohup sleep 2000000000 < /dev/lp2601 &
stty -parenb -enqak cs8 1200 -cstopb clocal ixon opost onclr < /dev/lp2601
```

2601A/Series 300 Pascal Interfacing

Default volume	PRINTER: or #6
Modules required	PRINTER, RS232 (or DATA_COMM)
Modules optional	None
Programming required	change HP-IB to SERIAL or DATA_COMM in CTABLE
Graphics dump supported	No

2601A Ordering Information

2601A	Daisywheel printer, 120 Vac 49-61 Hz includes 5-ft. RS-232C cable similar to 13242N
Option 015	220 Vac, 49-61 Hz
Option 016	100 Vac, 49-61 Hz
Option 017	240 Vac, 49-61 Hz
Option 242	Substitute 13242G cable for standard cable
Option 826	For use with HP 9000 computers
26010A	Forms tractor
26010D	Sheet feeder
Option 010	Upgrade for early 2601A printers
Option 020	Substitute 92177M DIN A4 paper trays
Option 030	Upgrade only (does not include feeder)
92151C	Black multistrike ribbon (box of 12)
92151D	Black fabric ribbon (box of 12)
92152A...L	Plastic printwheels (refer to *Computer Users Catalog*
92153A...W	Metallized printwheels (refer to *Computer Users Catalog*
92167W	Printwheel storage album
92177A	Sound absorbing mat
92177C	Sound enclosure for 2601A without sheet feeder
92177G	Sound enclosure for 2601A and sheet feeder
92177L	8.5×11-in. paper trays for 26010D
92177K	8.5×14-in. legal paper trays for 26010D
92177M	Portrait 210mm×297mm/A4 paper trays for 26010D
92177N	Landscape 210mm×297mm/A4 paper trays for 26010D
92177Q	Personal sheet feeder
92193C	Printwheel clean kit
92193D	Refill for 92193C
92193T	Platen Cleaner Pak™

2602A Daisywheel Printer

A 25 cps HP-IB daisywheel printer for up to 15.2-in. wide paper. The 2602A is a good choice where low cost letter-quality printing is required.

2602A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2602A	25 cps printer (RS-232C)	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
Option 046	HP-IB interface	NOP	Unsup.	Unsup.	4.0	No	Unsup.
26020A	Forms tractor	NA	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
92177R	Personal Sheet Feeder	NA	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

2602A Specification Summary

Data sheet (for complete specifications)	5953-6280
Dimensions	235mmH, 616mmW, 451mmD
Weight	23 kg
Interface and command set	HP-IB, similar to PCL1
Paper width (min., max.)	84mm, 387mm., fan-fold or sheet
Print speed	25 cps max., bidirectional
Print pitches (cpi)	Variable @ 1/120-in. increments
Line spacing (lpi)	Variable @ 1/48-in. increments
Character set	96 character printwheels
Graphics density (dpi)	NA
Configuration	internal switches
AC voltage required	120 Vac ±10%, 220 Vac +12/-10%, 240 Vac +12/-10%
AC frequency tolerance	49.5 to 61 Hz
AC power required (ave., max.)	90W, 120W

2602A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2602A#046	25 cps daisywheel printer	1	0...30	1	Normal	0.0m	None

The 2602A simply freezes the bus handshake when its data buffer is full. Because the buffer is 1500 bytes, and the print speed is only 25 cps, it can take 20 minutes or more before the bus is made available.

2602A/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 2602A. The examples which follow assume that the 2602A is at bus address 1 on the built-in interface (select code 7). SRQ (Service request), Off-line and self-test should be off.

2602A Switches	Sample Configuration
Single-strike ribbon	Per ribbon
Page length	Per paper
Self test	Off
SRQ Enable	Off
Listen Always	Off
HP-IB address	1

The use of non-ASCII printwheels typically requires software conversion of displayed (or stored) ROMAN8 or Roman Extension character codes to the 7-bit code required by the printwheel.

The RS-232C version of the 2602A has never been tested with a Series 300 computer.

2602A/Series 300 BASIC Interfacing

Suggested switch settings	HP-IB address (0 to 30, 1 typical)
Typical device specifier	701
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS supported	No

2602A/Series 300 HP-UX Interfacing

The HP-UX "printer" driver uses a (presently fixed) timeout of 5 minutes. Because the 2602A routinely causes timeout errors when printing more than 1500 characters at a time, the 2602A is not supported in HP-UX.

It may be possible to use the "hpib" driver (which has an infinite default timeout) and a printer-type user-written lp filter/spooler.

2602A/Series 300 Pascal Interfacing

Suggested switch settings	HP-IB address (0 to 30, 1 typical)
Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	None
Graphics dump supported	No

2602A Ordering Information

2602A	Printer (U.S. version)
Option 015	220 Vac, 49-61 Hz
Option 017	240 Vac, 49-61 Hz
Option 046	HP-IB interface (required)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
26020A	Forms tractor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92151H	Black multistrike ribbon (box of 12)
92262A...G	Plastic printwheels (refer to *Computer Users Catalog*
92167V	Printwheel storage album
92177A	Sound absorbing mat
92177D	Sound enclosure for 2602A without sheet feeder
92177G	Sound enclosure for 2602A and sheet feeder
92177R	Personal sheet feeder
92193T	Platen Cleaner Pak™
92220R	0.3m right-angle HP-IB cable
92265A	U.S. printwheel kit

26075A HP-IB Switch

The 26075A is a 24-pole 3-throw switch intended for connecting a single HP-IB peripheral to one, two or three host computers. The 26075A is recommended where a single infrequently used expensive peripheral (such as a 7978A tape drive) is shared between systems.

26075A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
26075A	HP-IB switch	NOP	Yes	Yes	4.0	5.0	3.1

26075A Specification Summary

Data sheet (for complete specifications)	5953-7105
Dimensions Weight	65mmH, 285mmW, 155mmD 1.4 kg
Interface Series resistance Capacitance	HP-IB 0.75 ohm max. 10 pf max. to signal ground
AC power	None - totally passive device
Switch life	50000 cycles minimum

26075A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
26075A	HP-IB switch	0	NA	0	Any	0.5m	None

26075A/Series 300 Interfacing

The 26075A is compatible with any Series 300 HP-IB interface and peripherals. It should not be used to share an HP-UX disc, as irrecoverable file system errors may result. Observe caution when using the 26075A to share peripherals with an HP3000. The 3000 automatically mounts tapes under its file system when the reel is mounted on the 7974A or 7978A.

26075A Ordering Information

26075A	HP-IB Switch
26075-90901	User Manual (one included w/26075A)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable

2608A 400 lpm Printer

A 400 line per minute dot-matrix impact printer for fan-fold single- or multi-part paper. The 2608A is no longer supplied.

2608A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2608A	400 lpm impact printer	NOP	No	No	No	No	No
Option 046	HP-IB interface	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

2608A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2608A Option 046	400 lpm impact printer HP-IB interface	1	0...7	1	N or H	0.0m	None

2608A/Series 300 Interfacing

The 2608A has not been tested with any Series 300 computer. Its primary character set is accessible to most HP-IB hosts which have simple HP-IB printer drivers. 2608A secondary character sets and other printing features may be accessible to HP-IB hosts which support secondary addressing (BASIC SEND..., HP-UX DIL, Pascal HP-IB library). The graphics raster command set is unique to the 2608A and is not supported by any HP 9000 graphics libraries or utilities.

The 2608A should not be connected to a 98625A interface. The operating system software may not be able to address it through this interface.

2608S 400 lpm Printer

A 400 line per minute dot-matrix impact printer for fan-fold single- or multi-part paper. The 2563A is generally more economical.

2608S/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2608S	400 lpm impact printer						
Option 290	CIPER HP-IB interface	NOP	Unsup.	Unsup.	No	5.0	No

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2608S	400 lpm printer	Unsup.	Unsup.	No	Unsup.	Unsup.	No

2608S HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2608S Option 290	400 lpm impact printer CIPER HP-IB interface	1	0...7	1	N or H	0.0m	None

2608S/Series 300 Interfacing

Although supported by the HP-UX 5.0/5.1 operating system on the Series 200, the 2608S is not qualified on the Series 300 and no regulatory testing is presently planned. The 2608S Option 290 or 850 is a CIPER-*only* printer and is not usable as even a simple print-and-space device in BASIC or Pascal.

Any Series 300 HP-IB interface may be used for the 2608S Option 290/850. The examples which follow assume that the 2608S is at bus address 1 on the built-in interface (select code 7).

2608S Function	Sample Configuration
LPI	6
Density	Your choice
Secondary language	Draw (0100)
Primary language	ASCII (0000)
HP-IB address	1

2608S/Series 300 HP-UX Interfacing

Driver required	`ciper`
Block-mode major number	NA
Character-mode major number	26
Spooler model file	`dumb`
DGL/*Starbase* handler	None

2608S/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Not Used	Not Used	Cooked vs Raw
Values (hex)	07 to 1F	00 to 07	0	1=NO-EJECT	0	0	1=RAW

Typical *mknod*s for 2608S Option 850 at select code 7, bus address 1

```
# mknod /dev/lp  c 26 0x070100
# mknod /dev/rlp c 26 0x070101
```

2608S/Series 300 HP-UX considerations:

- The 2608S may print graphics raster data supplied by the *dump_graphics.c* command. It may also print raster data supplied by the 2934A DGL handler (if the spooling bit is set), although this is not supported.

2621 Terminal

The 2621 is a low-cost 12-in. alphanumeric terminal with detached keyboard. It is no longer supplied, but was available in three versions: 2621A, 2621P and 2621B. The 2621A/P are identical except that the "P" version has a built-in thermal printer (offered as Option 050 on the 2621B).

2621/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2621A	Alphanumeric terminal	No	Unsup.	Unsup.	Unsup.	No	Unsup.
2621B	Alphanumeric terminal	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
2621P	Alphanumeric terminal+printer	No	Unsup.	Unsup.	Unsup.	No	Unsup.

2621/Series 300 Interfacing

The 2621A/P does not have Xon/Xoff handshaking. Data overruns are likely if used with Series 300 HP-UX at rates above 2400 baud. The 2621A/P also does not have a programmable "A-strap", memory lock or downloadable softkeys, features used by some HP-UX software. The 2621B does have Xon/Xoff, softkeys and memory lock (extended keyboard only).

HP-UX 5.0 does have *terminfo* entries for the 2621 (`2621`, `2621a`, `2621k45`, `2621p`, `hp2621`, `hp2621a`, `hp2621k45`). The correct performance of HP-UX with the 2621 is not guaranteed. The 2621 terminals are not planned for qualification on the Series 300.

2622A Alphanumeric Terminal

The 2622A is an alphanumeric terminal with detached keyboard and 12-in. CRT monitor. It is no longer supplied.

2622A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2622A	Graphics terminal	Rev. A	Planned	Planned	Unsup.	5.0	Unsup.

2622A/Series 300 Interfacing

The 2622A is compatible with all Series 300 RS-232C interfaces. Refer to the interface card discussions for information about the interface side of the connection. The 2622A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13222M (5m) or 13222N (5m) or 92217A (15m)	2622A port 1
DIR25(M)	13222C (5m) or 92217C (15m)	2622A port 1

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2622A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2622, hp2622, hp2622a`

2622A/ Series 300 HP-UX Considerations:

- The 98642A or 98628A interface are recommended for 9600 baud connections if there is also a 98625A interface in the system.

2623A Monochromatic Graphics Terminal

The 2623A is a monochromatic graphics terminal with detached keyboard and 12-in. CRT monitor. The 2393A or HP 150 are generally more flexible and economical unless a P4 white phosphor (standard) or P134 amber phosphor (Option 062) is required. The 2623A is user-installable.

2623A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2623A	Graphics terminal	Rev. A	Planned	Planned	Unsup.	5.0	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2623A	In HP graphics mode	Planned	Planned	No	5.0	5.0	No

2623A Specification Summary

Data sheet (for complete specifications)	5953-2070, 5953-8600
Dimensions, monitor	440mmH, 380mmW, 475mmD
Dimensions, keyboard	75mmH, 430mmW, 190mmD
Weight	21 kg (w/ Option 050)
Screen size	12-in. diagnonal
Phosphors	P4 White, P31 Green or P134 Amber
Refresh rate (independent of AC line)	60 Hz
Screen capacity	26 lines × 80 columns lines 25..26 for labels and status
Character resolution	7×11 w/½-dot shift in 9×15 cell
Graphics resolution	512×390
Softkeys	8, programmable
Character sets	HP Roman Extension, HP linedraw,
Display enhancements	Inverse, underline, blinking, halfbright
Other display features	Memory lock
Display memory	2 pages text, 1 graphics screen
Command sets	HP, ANSI, TEK®4010
Interface, port 1	RS-232C
port 2	RS-232C (for local peripherals only)
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600
Handshaking	Xon/Xoff, Enq/Ack, HP-DC1/DC2, SRR, DSR
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery backed
AC voltage required	100, 110, 220, 240 Vac (each +5-10%) 50 or 60 Hz (each ±5%)
AC power required (max.)	120 W (170 W/Option 050)

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2623A/Series 300 Interfacing

The 2623A is compatible with all Series 300 RS-232C interfaces as an alphanumeric terminal, but the buffered 98642A and 98628A are recommended for DGL and *Starbase* graphics. Refer to the interface card discussions for information about the interface side of the connection. The 2623A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13222M (5m) or 13222N (5m) or 92217A (15m)	2623A port 1
DIR25(M)	13222C (5m) or 92217C (15m)	2623A port 1

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2623A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required (alpha)	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Interface required (graphics)	98642A or 98628A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2623, 2623a, hp2623, hp2623a`
DGL handlers	`A0001, B0001, D0019, K0001, L0019, P0019, V0019`
Starbase handler	`/usr/lib/libdd262x.a`

2623A/Series 300 HP-UX Considerations:

- The 98642A or 98628A interfaces are recommended if a 98625A interface is also present in the system.
- The resolution of information entered via the 17623A tablet is limited by DGL and *Starbase* graphics to the screen resolution (512×390).
- The 2623A may work as a graphics output device with the single-byte buffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.
- Raster graphics printing is possible only to a terminal-interfaced printer.
- If "muting" mode is used on the 2623, national characters transmitted by typing a muting accent character (e.g. "¨") followed by an accentable character (e.g. "o") are *transmitted* as two characters (not as a single ROMAN8 character). This is not visible because as the system echoes them to the 2623A, and the terminal combines them into a single displayed character. Other supported terminals combine the keystokes in the terminal and transmit a single character.
- If "muting" mode is not used, only those accented national characters which appear on the keycaps of your keyboard are usable. (You can reconfigure your terminal as if you had a different localized keyboard, but you will need to refer to a keymap to determine which keys to strike.)

2623A Ordering Information

2623A	Graphics Terminal, 115 Vac, ASCII keyboard
Option 001	Substitutes Swedish/Finnish keyboard
Option 002	Substitutes Danish/Norwegian keyboard
Option 003	Substitutes French AZERTY keyboard
Option 004	Substitutes German keyboard
Option 005	Substitutes United Kingdom keyboard
Option 006	Substitutes Spanish keyboard
Option 013	240 Vac, 50 Hz
Option 014	100 Vac, 60 Hz
Option 015	220 Vac, 50 Hz
Option 016	100 Vac, 50 Hz
Option 050	Built-in thermal printer
Option 061	Green P31 screen
Option 062	Amber P134 screen
Option 202	Linedraw character set (included in Opts. 001-006)
Option 301	Adds 13222N U.S. modem cable
Option 302	Adds 13222M European modem cable
Option 401	Substitute tilt & swivel base.
Option F17	ANSI operation
02623-90001	2623 User's Manual (one included w/2623A)
02622-90008	2622/2623 Reference Manual (one included w/2623A)
02622-90007	2623 Service Manual
13222N	U.S.modem cable
13222M	European modem cable
1420-0259	Replacement battery
17623A*	Graphics tablet
92160A	Blue thermal paper (24 rolls)
92160B	Black thermal paper (24 rolls)
92911A	262x bar code reader

2624B Alphanumeric Terminal

The 2624B is an alphanumeric terminal with detached keyboard and 12-in. CRT monitor. Although it is a superset of the 2622A terminal and incorporates many on-board data entry and data validation features, HP-UX supports it as a 2622A. No HP9000 applications use 2624B features. The 2624B is user-installable.

2624B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2624B	Graphics terminal	Rev. A	Unsup.	Unsup.	Unsup.	5.0	Unsup.

* Some 2623As and/or 17623As may require a firmware upgrade to function properly with DGL and *Starbase* graphics. Some early 2623As may require a power supply upgrade to support the 17623A.

2624B/Series 300 Interfacing

The 2624B is compatible with all Series 300 RS-232C interfaces. Refer to the interface card discussions for information about the interface side of the connection. The 2624B-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13222M (5m) or 13222N (5m) or 92217A (15m)	2624B port 1
DIR25(M)	13222C (5m) or 92217C (15m)	2624B port 1

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2624B/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2624, hp2624, 2624a, hp2624a`

2624B/ Series 300 HP-UX Considerations:

- The 98642A or 98628A interface are recommended for 9600 baud connections if there is also a 98625A interface in the system.

2625A Dual-System Graphics Terminal

The 2625A is a monochromatic graphics terminal with detached keyboard and 12-in. CRT monitor. It has dual datacomm ports. Port1 provides an HP terminal personality similar to the HP 2622/23A. Port2 provides an IBM personality similar to the IBM 3276/8. Unless the IBM port is required, an HP 2393A or 2623A terminal would be more economical. The 2625A is user-installable.

2625A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
2625A	HP 2623A personality	Rev. A	Inves.	Inves.	Unsup.	5.0	Unsup.
	IBM 3276/8 personality	No	No	No	No	No	No
Option 523	Adds 2623 graphics	NA	Inves.	Inves.	Unsup.	5.0	Unsup.

Product	Description	Hardware Support 310	Hardware Support 320	Graphics Software Support BASIC Graphics	Graphics Software Support HP-UX DGL	Graphics Software Support HP-UX *Starbase*	Graphics Software Support Pascal DGL
2625A	HP/IBM graphics terminal	Inves.	Inves.	No	5.0	5.0	No

2625A Specification Summary

Data sheet (for complete specs.)	5953-8607
Dimensions, monitor	440mmH, 380mmW, 475mmD
Dimensions, keyboard	75mmH, 430mmW, 190mmD
Weight	23 kg
Screen size	12-in. diagnonal
Phosphors	P4 White, P31 Green or P134 Amber
Refresh rate	60 Hz (independent of AC line)
Screen capacity	27 lines × 80 columns lines 25..27 for labels and status
Character resolution	7×11 w/½-dot shift in 9×15 cell
Graphics resolution	512×390
Softkeys	8, programmable
Character sets	HP ROMAN8, HP linedraw,
Display enhancements	Inverse, underline, blinking, halfbright
Other display features	Memory lock
Display memory	up to 6 pages text standard, 1 graphics screen (with Option 523)
Command sets	HP, TEK®4010
Interface, port 1	RS-232C (25 or 50-pin)
port 2	IBM 3278
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19,200
Handshaking	Xon/Xoff, Enq/Ack, HP-DC1/DC2, SRR, DSR, CTS
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery backed
AC voltage required	100, 110, 220, 240 Vac (each +5-10%) 50 or 60 Hz (each ±5%)
AC power required (max.)	100 W (170 W/Option 050)

2625A/Series 300 Interfacing

The 2625A is compatible with all Series 300 RS-232C interfaces as an alphanumeric terminal, but the buffered 98642A and 98628A are recommended for DGL and *Starbase* graphics. Refer to the interface card discussions for information about the interface side of the connection. The 2625A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13242N (5m) or 13242M (5m) or 92218A (15m) or 92222M (.2m)	2625A port 1, 25-pin
DIR25(M)	None	2625A port 1, 25-pin

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2625A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required (alpha)	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Interface required (graphics)	98642A or 98628A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2625, hp2625`
DGL handlers	`A0001, B0001, D0020, K0001, L0019, P0019, V0019`
Starbase handler	`/usr/lib/libdd262x.a`

2625A/Series 300 HP-UX Considerations:

- The 98642A or 98628A interfaces are recommended if a 98625A interface is also present in the system.
- The resolution of information entered via the 17623A tablet is limited by DGL and *Starbase* graphics to the screen resolution (512×390).
- The 2625A may work as a graphics output device with the single-byte buffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.
- The 2625A can "raster dump" displayed graphics only to a terminal peripheral. The host system cannot readback displayed raster data.

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2625A Ordering Information

2625A	Dual system display terminal, 25-pin port1 RS-232C
Option 001	Substitutes Swedish keyboard
Option 002	Substitutes Norwegian keyboard
Option 004	Substitutes German keyboard
Option 005	Substitutes United Kingdom keyboard
Option 006	Substitutes Spanish keyboard
Option 007	Substitutes French Canadian keyboard
Option 008	Substitutes French AZERTY keyboard
Option 009	Substitutes Italian keyboard
Option 010	Substitutes Dutch keyboard
Option 011	Substitutes Finnish keyboard
Option 012	Substitutes Danish keyboard
Option 013	240 Vac, 50 Hz
Option 014	100 Vac, 60 Hz
Option 015	220 Vac, 50 Hz
Option 016	100 Vac, 50 Hz
Option 022	Substitute 50-pin RS-232C port1
Option 026	25-pin RS-232C port1 plus an HP-IB port (requires Opt. 523)
Option 047	IBM first BISYNC port2 (one of Option 047 or 048 required)
Option 048	IBM daisychain (n^{th}) BISYNC port2
Option 050	Built-in thermal printer
Option 061	Green P31 screen
Option 062	Amber P134 screen
Option 301	Adds 13242N 25-pin U.S. modem cable
Option 302	Adds 13242M 25-pin European modem cable
Option 401	Substitute tilt & swivel base.
02625-90001	2625 User's Manual (spiral-bound, one included w/2625A)
02625-90002	2625 Reference Manual (full-size, one included w/2625A)
02625-90003	2625 Service Manual (full-size)
13222N	50-pin U.S.modem cable
13222M	50-pin European modem cable
13242N	25-pin U.S.modem cable
13242M	25-pin European modem cable
1420-0259	Replacement battery
92160A	Blue thermal paper (24 rolls)
92160B	Black thermal paper (24 rolls)
92171R	Palm rest

2626A/W Alphanumeric Terminal

The 2626A is an alphnumeric terminal with detached keyboard and 12-in. CRT monitor. It is a superset of the 2622A terminal and incorporates dual simultaneous datacomm and local windowing features. HP-UX treats it only as a 2622A. The 2626A has very poor scrolling performance in the *vi* editor. It should not be purchased for use with HP-UX unless the dual-datacomm feature is required and *vi* will not be used.

The 2626W is a 2626A with HP3000 HPWORD features. HP-UX does not support HPWORD. All considerations concerning the 2626A apply to the 2626W. The 2626W is no longer supplied, having been replaced by the 2628A (or 2625A Option 528).

2626A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2626A	Display Station	Rev. A	Unsup.	Unsup.	Unsup.	5.0	Unsup.

2626A/Series 300 Interfacing

The 2626A is compatible with all Series 300 RS-232C interfaces. Refer to the interface card discussions for information about the interface side of the connection. The 2626A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DIR25(M)	13222C (5m) or 92217C (15m)	2626A port 1
DIR25(M)	None	2626A port 2
DCE(F)	13222M (5m) or 13222N (5m) or 92217A (15m)	2626A port 1
DCE(F)	13242N (5m) or 13242M (5m) or 92218A (15m) or 92222M (.2m)	2626A port 2

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2626A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2626, hp2626, 2626a, hp2626a` and others

2626A/ Series 300 HP-UX Considerations:

- The 98642A or 98628A interface are recommended for 9600 baud connections if there is also a 98625A interface in the system.
- The *terminfo* entry for the 2626A describes only a 24 line×80 column screen. Each local window/workspace sizes other than 24×80 requires that you create a separate *terminfo* entry. Changing window/workspace sizes after login requires that you change and re-export your TERM variable.

2627A Color Graphics Terminal

The 2627A is a color graphics terminal with detached keyboard and 12-in. CRT monitor. The 2397A is generally more flexible and economical. The 2627A is user-installable.

2627A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2627A	Graphics terminal	Rev. A	Inves.	Inves.	Unsup.	5.0	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2627A	In HP graphics mode	Yes	Yes	No	5.0	5.0	No

2627A Specification Summary

Data sheet (for complete specifications)	5953-8602
Dimensions, monitor	440mmH, 380mmW, 475mmD
Dimensions, keyboard	75mmH, 430mmW, 190mmD
Weight	22.3 kg
Screen size	12-in. diagnonal
Phosphors	P22 Color
Colors	8
Refresh rate (independent of AC line)	60 Hz
Screen capacity	26 lines × 80 columns lines 25..26 for labels and status
Character resolution	7×11 w/½-dot shift in 9×15 cell
Graphics resolution	512×390
Softkeys	8, programmable
Character sets	HP Roman Extension, HP linedraw,
Display enhancements	Inverse, underline, blinking, halfbright
Other display features	Memory lock
Display memory	2 pages text, 1 graphics screen
Command sets	HP, ANSI, TEK®4010
Interface, port 1	RS-232C, 50-pin
port 2	RS-232C (for local peripherals only)
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600
Handshaking	Xon/Xoff, Enq/Ack, HP-DC1/DC2, SRR, DSR
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery backed
AC voltage required	100, 110, 220, 240 Vac (each +5-10%) 50 or 60 Hz (each ±5%), 200 Watts max.

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2627A/Series 300 Interfacing

The 2627A is compatible with all Series 300 RS-232C interfaces as an alphanumeric terminal, but the buffered 98642A and 98628A are recommended for DGL and *Starbase* graphics. Refer to the interface card discussions for information about the interface side of the connection. The 2627A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13222M (5m) or 13222N (5m) or 92217A (15m)	2627A
DIR25(M)	13222C (5m) or 92217C (15m)	2627A

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2627A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required (alpha, graphics)	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Interface required (DGL graphics)	98642A or 98628A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2627, 2627a, hp2627, hp2627a`
DGL handlers	`A0001, B0001, D0036, K0001, L0019, P0019, V0019`
Starbase handler	`/usr/lib/libdd262x.a`

2627A/Series 300 HP-UX Considerations:

- The 98642A or 98628A interfaces are recommended if a 98625A interface is also present in the system.
- The resolution of information entered via the 17623A tablet is limited by DGL and *Starbase* graphics to the screen resolution (512×390).
- The 2627A may work as a graphics output device with the single-byte buffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.
- Raster printing is possible only to a terminal-interfaced printer. The host system cannot readback displayed images.

2627A Ordering Information

2627A	Graphics Terminal, 115 Vac, ASCII keyboard
Option 001	Substitutes Swedish/Finnish keyboard
Option 002	Substitutes Danish/Norwegian keyboard
Option 003	Substitutes French AZERTY keyboard
Option 004	Substitutes German keyboard
Option 005	Substitutes United Kingdom keyboard
Option 006	Substitutes Spanish keyboard
Option 013	240 Vac, 50 Hz
Option 014	100 Vac, 60 Hz
Option 015	220 Vac, 50 Hz
Option 016	100 Vac, 50 Hz
Option 087	RGB video output
Option 301	Adds 13222N U.S. modem cable
Option 302	Adds 13222M European modem cable
Option F17	ANSI operation
02627-90001	2627 User's Manual (one included w/2627A)
02622-90008	2627 Reference Manual (one included w/2627A)
02622-90007	2627 Service Manual
13222N	U.S.modem cable
13222M	European modem cable
1420-0259	Replacement battery
17623A*	Graphics tablet
92911A	262x bar code reader

* Some 2627As and/or 17623As may require a firmware upgrade to function properly with DGL and *Starbase* graphics.

2628A Word Processing Terminal

The 2628A is a monochromatic graphics terminal with detached keyboard and 12-in. CRT monitor. It has on-board firmware and download capability which optimize it for use with HPWORD on the HP3000. It has a single host datacomm port. Unless used with an RS-232C switch to an HP3000, the 2392A or 2393A terminals are a more economical choice. The 2628A is nearly identical to the 2625A Option 528 with the exception that the 2628A has no IBM 3276/8 capability. The 2628A is user-installed.

2628A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2628A	Word processing terminal	Rev. A	Inves.	Inves.	Unsup.	5.0	Unsup.
Option 523	Adds 2623 graphics	NA	Inves.	Inves.	Unsup.	5.0	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2628A#523	Graphics terminal	Inves.	Inves.	No	5.0	5.0	No

2628A Specification Summary

Data sheet (for complete specifications)	5953-8611
Dimensions, monitor	440mmH, 380mmW, 475mmD
Dimensions, keyboard	75mmH, 430mmW, 190mmD
Weight	23 kg
Screen size	12-in. diagnonal
Phosphors	P4 White, P31 Green or P134 Amber
Refresh rate (independent of AC line)	60 Hz
Screen capacity	27 lines × 80 columns lines 25..27 for labels and status
Character resolution	7×11 w/½-dot shift in 9×15 cell
Graphics resolution	512×390
Softkeys	8, programmable
Character sets	HP ROMAN8, HP linedraw,
Display enhancements	Inverse, underline, blinking, halfbright
Other display features	Memory lock
Display memory (pages)	up to 6 text std., 1 graphics (w/Opt. 523)
Command sets	HP, TEK®4010
Interface, port 1	RS-232C (25 or 50-pin)
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19,200
Handshaking	Xon/Xoff, Enq/Ack, HP-DC1/DC2, SRR, DSR, CTS
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery backed
AC voltage required	100, 110, 220, 240 Vac (each +5-10%), 50 or 60 Hz
AC power required (max.)	100 W (170 W/Option 050)

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2628A/Series 300 Interfacing

The 2628A is compatible with all Series 300 RS-232C interfaces as an alphanumeric terminal, but the buffered 98642A and 98628A are recommended for DGL and *Starbase* graphics. Refer to the interface card discussions for information about the interface side of the connection. The 2628A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13242N (5m) or 13242M (5m) or 92218A (15m) or 92222M (.2m)	2628A port 1, 25-pin
DIR25(M)	None	2628A port 1, 25-pin

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

2628A/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required (alpha)	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Interface required (graphics)	98642A or 98628A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2628, hp2628`
DGL handlers	`A0001, B0001, D0020, K0001, L0019, P0019, V0019`
Starbase handler	`/usr/lib/libdd262x.a`

2628A/Series 300 HP-UX Considerations:

- The 98642A or 98628A interfaces are recommended if a 98625A interface is also present in the system.
- The resolution of information entered via the 17623A tablet is limited by DGL and *Starbase* graphics to the screen resolution (512×390).
- The 2628A may work as a graphics output device with the single-byte buffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.
- Raster graphics printing is possible only to a terminal-interfaced printer. The host system cannot readback graphics images.

2628A Ordering Information

2628A	Word processing terminal, 25-pin port1 RS-232C
Option 001	Substitutes Swedish keyboard
Option 002	Substitutes Norwegian keyboard
Option 004	Substitutes German keyboard
Option 005	Substitutes United Kingdom keyboard
Option 006	Substitutes Spanish keyboard
Option 007	Substitutes French Canadian keyboard
Option 008	Substitutes French AZERTY keyboard
Option 009	Substitutes Italian keyboard
Option 010	Substitutes Dutch keyboard
Option 011	Substitutes Finnish keyboard
Option 012	Substitutes Danish keyboard
Option 013	240 Vac, 50 Hz
Option 014	100 Vac, 60 Hz
Option 015	220 Vac, 50 Hz
Option 016	100 Vac, 50 Hz
Option 022	Substitute 50-pin RS-232C port1
Option 026	25-pin RS-232C port1 plus an HP-IB port (requires Opt. 523)
Option 050	Built-in thermal printer
Option 061	Green P31 screen
Option 062	Amber P134 screen
Option 301	Adds 13242N 25-pin U.S. modem cable
Option 302	Adds 13242M 25-pin European modem cable
Option 401	Substitute tilt & swivel base.
02625-90001	2628 User's Manual (one included w/2628A)
02625-90002	2628 Reference Manual (one included w/2628A)
02625-90003	2628 Service Manual
13222N	50-pin U.S.modem cable
13222M	50-pin European modem cable
13242N	25-pin U.S.modem cable
13242M	25-pin European modem cable
1420-0259	Replacement battery
92160A	Blue thermal paper (24 rolls)
92160B	Black thermal paper (24 rolls)
92171R	Palm rest

2631 Printers

The 2631B and 2631G are 180 cps dot-matrix HP-IB impact printers for up to 15¼-in. wide paper. The 2631G offerred graphics printing, and the 2631B offerred a wider variety of character sets and printing features than the 2631G. This family of printers is no longer supplied, having been replaced by the 2932/34A printers. (The even earlier 2631A is essentially the same as the 2631B, except that the 2631A does not have AMIGO protocol and cannot be paced by HP-UX).

2631/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
2631A Option 046	180 cps printer HP-IB interface	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
2631B Option 046	180 cps printer HP-IB interface	NOP	Inves.	Inves.	Unsup.	5.0	3.1
2631G	180 cps printer	NOP	Inves.	Inves.	Unsup.	5.0	3.1

Product	Description	Hardware Support 310	Hardware Support 320	Graphics Software Support BASIC Graphics	Graphics Software Support HP-UX DGL	Graphics Software Support HP-UX *Starbase*	Graphics Software Support Pascal DGL
2631G	180 cps printer	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

2631 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2631A	180 cps printer	1	0...30	1	N or H	0.0m	None
2631B	180 cps printer	1	0...30	1	N or H	0.0m	None
2631G	180 cps printer	1	0...30	1	N or H	0.0m	None

2631/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 2631A. AMIGO protocol printers (2631B/G) are useable on the 98625 interface.

2631A/B/G Switches	Sample Configuration
HP-IB Address	1
SRQ	Off
LA (Listen Always)	Off

2631/Series 300 BASIC Interfacing

Typical device specifier	`701`
Binaries required	HP-IB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS	No (2631A/B) Yes (2631G)

2631/Series 300 HP-UX Interfacing

HP-IB address	0 to 7 if pacing desired
Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	`2631g`
DGL/*Starbase* handler	None

2631/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3**	**2**	**1**	**0**
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Not Used	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	0	1="NOCR"	1=RAW

Typical *mknod*s for 2631 at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

2631/Series 300 HP-UX Considerations:

- The 2631B and 2631G must be set to an HP-IB address in the range 0 to 7 in order to enable the AMIGO pacing protocol.
- The 2631A has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 2631A. If you have a built-in and a 98624A interface, use the 98624A for the 2631A. If possible, a dedicated 98624A is suggested.
- The 2631G can print graphics raster data supplied by the *dump_graphics.c* command.

2631/Series 300 Pascal Interfacing

Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump supported	2631G only

264x-Series Terminals

The 264x-series are 10-in. alphanumeric or graphics terminals with detached keyboard. They are no longer offered, but were available in several versions:

2640A/B	2400 baud text-only (8008-based)
2642A	2645A plus text processing and flexible discs
2644A	2640A plus mini-cartridges
2645A	9600 baud text-only, optional mini-cartridges (8080-based)
2647A	2648A plus local BASIC programming
2647F	2647A plus flexible discs (and 8085-based)
2648A	2645A plus graphics
2649	Various OEM versions

264x/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2640..49	Terminals	No	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
2642A	Terminals	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
2647F	Terminals	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2647A/F	Graphics terminals	Unsup.	Unsup.	No	Unsup.	No	No
2648A	Graphics terminal	Unsup.	Unsup.	No	Unsup.	No	No

264x-Series/Series 300 Interfacing

HP-UX 5.0 does have *terminfo* entries for some 264x-series terminals. The correct performance of HP-UX with the 264x-series is not guaranteed. The 264x-series terminals are not planned for qualification on the Series 300.

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13232N (5m) or 13232M (5m) or 92219A (15m)	264x
DIR25(M)	13232C (5m) or 92219D (15m)	264x
DIR25(F)	13232Y (5m) or 92219E (15m)	264x

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

264x/Series 300 HP-UX Interfacing

None of the 264x-series terminals are supported by Series 200 or 300 HP-UX. Many can be used to some extent. Here is a list of the known issues:

- **All except 2642A, 2647F** - do not usually have Xon/Xoff handshaking. Character framing errors and/or data overruns may occur on output at speeds above 2400 baud. Although the 2640A/B and 2644A have a maximum rate of 2400 baud, they also have a slower 8008 processor.
- **2647A/F, 2648A** - An unsupported handler (D0001) is supplied. This handler has only been tested with the 2647F on the Series 500. Raster printing is possible only to a terminal-interfaced printer. The host system cannot readback the graphics display.
- **2640A/B, 2644A** - do not have a programmable "A-strap". Cursor control (arrow) keys and edit keys cannot be used in *vi* unless the terminal is opened and the keyboard "A" strap physically installed.
- **2642A** - LIF ASCII files created on the 2642A have embedded $^{C}R^{L}F$ sequences at the end of each record. These can be removed in HP-UX with the *vi* (and other) editors.
- Many of these terminals support local peripherals, including mass storage devices. Although some features of these devices are accessible to user programs in HP-UX, others are not. For example, binary mass storage data transfer is generally impossible except at *very* low baud rates. Many operations (such as copying displayed graphics data to a mini-cartridge) require considerable time. Without Xon/Xoff pacing, data overruns are quite likely.

Terminfo entries included are: **2640, 2640a, 2640b, hp2640a, hp2640b, 2644, 2644a, hp2644, hp2644a, 2645, hp2645, 2647, 2647F, 2648, 2648a, hp2648, hp2648a.**

2671A/G, 2673A Thermal Printers

The 2670-series are 120 cps thermal dot matrix printers for 8½-in. wide paper. In general, the 2225A *ThinkJet* or 82906A printers are faster and more economical unless your application requires the line drawing or math (2673A only) character sets.

2671/73/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2671A	120 cps printer (HP-IB)	NOP	Planned	Planned	Unsup.	Inves.	Unsup.
2671G	120 cps printer (HP-IB)	NOP	Planned	Planned	Unsup.	Inves.	Unsup.
2673A	120 cps printer (HP-IB)	NOP	Planned	Planned	Unsup.	Inves.	Unsup.
Option 008	JASCII/KANA8	NOP	Planned	Planned	Unsup.	Inves.	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2671G	120 cps printer	Planned	Planned	Unsup.	Unsup.	Unsup.	Unsup.
2673A	120 cps printer	Planned	Planned	Unsup.	Unsup.	Unsup.	Unsup.

2671/73 Specification Summary

Data sheet (for complete specifications)	5953-6282 (2671A/G) 5953-6281 (2673A)
Dimensions	105mmH, 428mmW, 424mmD
Weight	6.9 kg
Interface and command set	HP-IB, PCL-1
Paper width	8½-in.
Print speed	120 cps, bidirectional, optimized path
Character cell	7×11
Print pitches (cpi)	5.0 (2673A only), 10.0, 16.5
Length lengths (respectively)	40, 80, 132
Line spacing (lpi)	6 or variable
Character set	Roman Extension
Graphics density (dpi)	90×90 (2671G, 2673A only)
AC voltage required	100, 120, 220, 240 (+5,-10%)
AC frequency tolerance	47.5 to 66 Hz
AC power required (idle, max.)	15 W, 50 W

2671/73 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
2671/73	120 cps printers	1	0...30	1	N or H	0.0m	None

2671/73/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 2671/73.

2671A/G-73A Switches	Sample Configuration
HP-IB Address	1
SRQ	Off
LA (Listen Always)	Off

2671/73/Series 300 BASIC Interfacing

Typical device specifier	`701`
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS	No (2671A) May work (2671G, 2673A only)

2671/73/Series 300 HP-UX Interfacing

Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	modify `2225a`
DGL/*Starbase* handler	None

2671/73/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case Fold	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	1=UPPER	1="NOCR"	1=RAW

Typical *mknod*s for 2671/73 at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

2671/73/Series 300 HP-UX Considerations:

- The 2671/73 has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 2671/73. If you have a built-in and a 98624A interface, use the 98624A for the 2671/73. If possible, a dedicated 98624A is suggested.
- The 2671G and 2673A may print graphics raster data supplied by the *dump_graphics.c* command.

2671/73/Series 300 Pascal Interfacing

Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump	May work (2671G, 2673A only)

2671/73 Ordering Information

2671A	120 cps text printer
2671G	120 cps text/graphics printer
2673A	120 cps intelligent text/graphics printer
Option 008	Replace USASCII set with JASCII/KANA8
02671-90017	2671A/G Service manual
02671-90018	2673A Service manual
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92160A	Blue thermal paper, 8½ ×11, (24 rolls)
92160B	Black thermal paper, 8½ ×11, (24 rolls)
92160C	Black thermal paper, 8½ ×11, page-perforated (24 rolls)
92160M	Blue thermal paper, 8½ ×11, fan-fold (4 packs)
92160N	Black thermal paper, 8½ ×11, fan-fold (4 packs)
92220R	0.3m right-angle HP-IB cable

2686A *LaserJet* Printer

An 8 page per minute laser printer for cut-sheet paper. The 2686A is a good choice where high-speed, letter-quality and low noise are criteria. The 2686A accepts one optional plug-in font ROM.

2686A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2686A	*LaserJet* printer	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2686A	*LaserJet* printer	Yes	Yes	Raster Dump	Unsup.	Raster Dump	Raster Dump

2686A Specification Summary

Data sheet (for complete specifications)	5954-0761
Dimensions (with trays)	293mmH, 475mmW, 723mmD
Weight	32 kg
Interface and command set	RS-232C, PCL-3
Paper width	8½-in. or 210mm
Print speed	8 ppm
Print pitches (cpi)	Font-dependent
Line spacing (lpi)	Variable @ 1/48-in. increments
Character set	multiple 128 or 256, depending on font ROM
Graphics density (dpi)	75, 100, 150 or 300
Maximum graphics pixels	472000 per page (approx. full page at 75 dpi)
Paper tray capacity	100 sheets
Data rates (baud)	300, 600, 1200, 2400, 4800, 9600, 19,200
Handshaking	Xon/Xoff, DTR
Character frame	8 bits, parity none
Configuration	internal switches
AC voltage required	115, 220, 240 ±10%
AC frequency tolerance	48 to 66 Hz
AC power required (max.)	850 Watts

2686A/Series 300 Interfacing

The 2686A may be used with any Series 300 RS-232C interface. At speeds above 2400 baud, some kind of flow control (pacing) is required. See each operating system section for details. The examples which follow assume that the 2686A is connected to an interface at select code 9. This section assumes factory defaults on the 2686A (RS-232C, 9600 baud, DTR active high).

The suggested interface is any RS-232C interface and cable which provides a DTE connection, such as the Series 300 built-in interface with 13242N or 92221M cable. The interface should be configured (if possible) for 9600 baud, 8 bits/character, 1 stop bit, no parity, Xon/Xoff handshake, modem status lines (DSB & CTS) connected. The 2686A does not include a cable.

Host Connection	Peripheral Cable	Peripheral	Comments
DTE(M)	17255D (1m)	2686A	BASIC, HP-UX, Pascal and stand-alone systems
DCE(F)	92222M (.25m), or 13242N (5m), or 92218A (15m)	2686A	HP-UX only
DIR9(F)	92221P (1.5m)	2686A	HP-UX only
DIR25(F)	13242G (5m)	2686A	HP-UX only
DIR25(M)	None	2686A	HP-UX only

2686A/Series 300 BASIC Interfacing

Typical device specifier	9
Binaries required	SERIAL or DCOMM (98628A)
Binaries optional	IO, TRANS
Programming required	`CONTROL 9,3;9600` (on 98644A or built-in RS232) `PRINTER IS 9` (all configurations)
Programming restrictions	TRANSFER supported on 98628A only
DUMP GRAPHICS	supported

2686A/Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1
Spooler model file	`2686a`
DGL/*Starbase* handler	None

2686A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
				Access Type			
Fields	Select Code	98642A port*	Not Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	00 to 03	0	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod* for 2686A at select code 9

```
# mknod /dev/lp  c 1 0x090005
```

* For 98642A Mux ports only, otherwise zero (0).

2686A/Series 300 HP-UX Considerations:

- If you prefer not to use the 2686A spooler model, you can insert the following shell commands in */etc/rc*. This will properly configure the RS-232 interface for unspooled printing.

```
nohup sleep 2000000000 < /dev/lp &
stty -parenb -ienqak cs8 9600 -cstopb -clocal ixon opost onlcr tab3 < /dev/lp
```

- To configure the port for raster graphics printing, execute the following *stty* command (or equivalent *ioctl(2)* calls. Reissue the preceding sequence after printing the raster data.

```
stty -parenb -ienqak cs8 9600 -cstopb -clocal ixon -opost < /dev/lp
```

2686A/Series 300 Pascal Interfacing

Default volume	PRINTER: or #6
Modules required	PRINTER, RS232 or DATA_COMM (98628A)
Modules optional	None
Programming required	change HP-IB to SERIAL in CTABLE The 98644A and built-in interfaces require a small program to change the default baud rate and character frame.
Graphics dump supported	Yes

2686A Ordering Information

2686A	*LaserJet* printer, 115 Vac, 60 Hz, for 8½-in. wide paper
2686AB	220 Vac 50 Hz version with A4-size paper tray
2686AU	240 Vac 50 Hz version with A4-size paper tray
17255D	Male-to-female RS-232 cable (for hardware-handshake connections)
92285A	Toner (EP) cartridge (one included w/2686)
92285B	8½×11-in. paper tray (one included w/2686A)
92285C	8½×14-in. paper tray
92285D	Metric A4-size paper tray (one included w/2686AB and 2686AU)
92285E	Metric B5-size paper tray
92285J	Overhead transparency film (50 sheets)
92285K	Adhesive label stock, 33 1×2.75-in. per sheet (100 sheets)
92285L	Adhesive label stock, 24 1.375×2.75-in. per sheet (100 sheets)
92285M	Adhesive label stock, 8 2.75×4.25-in. per sheet (100 sheets)
92285P	Font organizer (holds four font cartridges)
92285Q	Output print tray
92285R	Auxiliary print tray
92285S	Manual print tray
92285T	Service kit (2 separator belts and 2 felt cleaner pads)

2686A Font Cartridges

Those interested in creating page composition software for the proportional fonts should contact HP's Boise Division for information concerning font metrics.

Font Style	Orientation	Point Size	Pitch	Weights	Symbol Set
Internal Font					
Courier	Port. & Land.	12	10	Medium	ROMAN8
92286A Courier					
Courier	Portrait	12	10	Bold, Ital.	ROMAN8
Courier	Landscape	12	10	Bold, Ital.	ROMAN8
Line Printer	Landscape	8.5	16.6	Medium	ROMAN8
92286B Tms Proportional I					
Tms Rmn	Portrait	10	Prop.	M, B, I	ASCII
Tms Rmn	Portrait	8	Prop.	Medium	ASCII
Helv	Portrait	14.4	Prop.	Bold	ASCII
Line Printer	Landscape	8.5	16.6	Medium	ROMAN8
92286C International I					
Courier	Portrait	12	10	Bold, Ital.	ROMAN8
Line Printer	Port. & Land.	8.5	16.6	Medium	ROMAN8
92286D Prestige Elite					
Prestige Elite	Portrait	10	12	M, B, I	ROMAN8
92286E Letter Gothic					
Letter Gothic	Portrait	10	12	M, B, I	ROMAN8
92286F* Tms Proportional II					
Tms Rmn	Portrait	10	Prop.	M, B, I	ROMAN8
Tms Rmn	Portrait	8	Prop.	Medium	ROMAN8
Helv	Portrait	14.4	Prop.	Bold	ASCII
Line Printer	Landscape	8.5	16.6	Medium	ROMAN8
92286G* Legal Elite					
Prestige Elite	Portrait	10	12	M, B, I	ASCII
Prestige Elite	Portrait	7	12	Medium	ASCII
Prestige Legal	Port. & Land.	10	12	M, B, I	LEGAL
Prestige Legal	Port. & Land.	7	16.6	Medium	LEGAL
Line Draw	Portrait	12	12	Medium	DRAW7
92286H Legal Courier					
Courier	Portrait	10	12	Bold, Ital.	ASCII
Courier Legal	Portrait	10	12	M, B, I	LEGAL
Prestige Legal	Port. & Land.	10	12	M, B, I	LEGAL
Prestige Legal	Port. & Land.	7	16.6	Medium	LEGAL
Line Draw	Portrait	12	10	Medium	DRAW7
92286J Math Elite					
Prestige Elite	Portrait	10	12	M, B, I	ROMAN8
Prestige Legal	Portrait	7	16.6	Medium	LEGAL
Prestige Math	Portrait	10	12	Medium	MATH8
Prestige Math	Portrait	7	16.6	Medium	MATH8
Prestige PI Font	Portrait	10	12	Medium	PI Font

* Printers which have a self-test printout date code earlier than 840606 require an 02686-67002 firmware upgrade kit.

2686A Fonts, continued...

Font Style	Orientation	Point Size	Pitch	Weights	Symbol Set
92286L Courier P&L					
Courier	Port. & Land.	12	10	Bold, Ital.	ROMAN8
Line Printer	Port. & Land.	8.5	16.6	Medium	ROMAN8
92286M Prestige Elite P&L					
Prestige Elite	Port. & Land.	10	12	M, B, I	ROMAN8
92286N Letter Gothic P&L					
Letter Gothic	Port. & Land.	12	12	M, B, I	ROMAN8
92286P Tms Rmn					
Tms Rmn	Port. & Land.	12	Prop.	M, B, I	ROMAN8
92286Q Memo I					
Courier	Port. & Land.	12	10	Bold, Ital.	ROMAN8
Letter Gothic	Portrait	12	12	Med., Bold	ROMAN8
92286T Tax I					
Line Draw	Portrait	12	10	Medium	DRAW7
Helv	Portrait	8, 10, 12, 14	Prop.	Bold	ASCII
Helv	Portrait	6, 8	Prop.	Medium	ASCII
92286U Forms Portrait					
Helv2	Portrait	10, 12, 14	Prop.	Bold	ROMAN8
Helv2	Portrait	6, 8	Prop.	Medium	ROMAN8
Letter Gothic	Portrait	9.5	16.7	Medium	ROMAN8
Line Draw	Portrait	12	10	Medium	DRAW7
92286V Forms Landscape					
Helv2	Landscape	10, 12, 14	Prop.	Bold	ROMAN8
Helv2	Landscape	6, 8	Prop.	Medium	ROMAN8
Letter Gothic	Landscape	9.5	16.7	Medium	ROMAN8
Line Draw	Landscape	12	10	Medium	DRAW7
92286W 3-of-9/OCR A					
3-of-9	Portrait	12	4.6, 9.3	Medium	3 of 9
OCR-A	Portrait	12	10	Medium	OCR-A
Letter Gothic	Portrait	9.5, 14	16.7, 10	Medium	ROMAN8
Line Draw	Portrait	12	10	Medium	DRAW7

2687A Laser Printer

A 12 page per minute laser printer for cut-sheet paper. Although not supported, the 2687A can generally be made to operate by using the same interfacing, cabling and software as the 2686A *LaserJet*. The 2687A does not have graphics printing capability.

The 2687A does not have programmable margins. All text lines begin at the physical left edge of the page. User-written software must insert leading blanks in output lines if a margin is desired.

2687A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2687A	Laser printer	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

2688A Laser Printer

A 12 page per minute laser printer for cut-sheet paper. The 2688A uses a command language (DCS) unique to it and the 2680A. Although a driver existed for Pascal 2.1 (as part of the 33402A HP T_EX software, no longer supplied), there are no plans to port it to Pascal 3.1.

2688A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2688A	Laser printer	NOP	No	No	No	No	No

2703A Terminal

The 2703A is a high-performance color graphics terminal with local mass storage and applications execution capability. It is no longer supplied.

2703A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2703A	Terminal	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

2703A/Series 300 Interfacing

HP-UX 5.0 has *terminfo* (`2703`, `hp2703`) entries for the 2703A terminal. The correct performance of HP-UX with the 2703A is not guaranteed. The 2703A terminal is not planned for qualification on the Series 300.

2703A/Series 300 HP-UX Interfacing

The 2703A terminal is not supported by Series 200 or 300 HP-UX. It is likely to work as an alphanumeric device. No DGL or *Starbase* handler is is provided, although the 2703A may display spooled graphics created for the 2627A.

27201A Speech Output Module

The 27201A is a paperback book-size RS-232C device that converts escape sequences to synthesized human voice. It will no longer be supplied after Nov. 1, 1985.

27201A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
27201A	Speech Output Module	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

27201A/Series 300 Interfacing

The 27201A was offered with a 50-pin "eavesdrop" or 25-pin "stand-alone" connection. The standard 50-pin connection required that the host (computer interface or terminal) supply power. The 27201A uses Xon/Xoff or Enq/Ack handshaking and operates at common data rates from 150 to 19,200 baud.

No HP9000 computer has ever supported the 27201A. The following are considerations for attempting to use it:

- Only the 98626A and 98628A interfaces have the 50-pin connector required by the standard 27201A and 27201A Option 002.
- The 27201A can "hang" the RS-232C communications if an ASCII DC1 is sent immediately following a status command. Some experimentation with inserted wait states would be necessary to work around this. Timed waits between output characters on the 98628A and 98642A interfaces may be nullified by the buffering used on these cards.
- The combinations of escape sequences required to produce intelligible speech are not trivial. A speech library IMAGE data base was offered for the HP1000 and HP3000. If you also have one of these computers, it might be possible to migrate the data to an HP9000 LIF or HP-UX file.

28641A ThinMAU

Refer to product 98643A.

2932A Printer

A 200 cps dot-matrix HP-IB impact printer for up to 15.75-in. wide paper. The 2932A is a good choice where medium speed multi-part printing or printing on wide paper is required.

2932A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2932A	RS-232C interface	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
Option 046	HP-IB interface	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2932A#046	200 cps printer	Raster Dump	Vector or Raster Dump	Raster Dump	Raster Dump

2932A Specification Summary

Data sheet (for complete specifications)	5953-6276, 5953-9457
Dimensions	185mmH, 600mmW, 365mmD
Weight	20.4 kg
Interface and command set	HP-IB (Option 046), PCL-2
Print speed	200 cps, bidirectional, optimized path
Character cell	9×12
Character sets	ROMAN8, KANA8, Linedraw, Math
Fonts	Courier and Cubic
Print pitches (cpi)	5.0, 10.0, 16.36
Line lengths (respectively)	68, 136, 223
Line spacing (lpi)	1, 2, 3, 4, 6, 8, 12
Character set	HP ROMAN8, KANA8, Linedraw, Math
Graphics density (dpi)	90×90
Paper width (min., max.)	57mm (2.25-in.), 400mm (8½-in.), fan-fold
Paper weights	15 to 100# single part 12# up to 6-part
AC voltage required	100, 120, 220, 240 +5/-10%
AC frequency tolerance	47.5 to 66 Hz
AC power required (idle, max.)	120 VA, 300 VA

2932A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Provided
2932A#046	200 cps printer	1	0...30	1	N or H	0.0m	None

2932A/Series 300 Interfacing

BASIC, Pascal and HP-UX support the 2932A connected to either the built-in HP-IB or 98624A. When the AMIGO protocol of the 2932A is enabled, HP-UX also supports connection via the 98625 interface.

2932A Configuration Parameter	Sample Value
PRIMARY PRINT PITCH	10
SECONDARY PRINT PITCH	10
PRIMARY STYLE	Cubic
SECONDARY STYLE	Cubic
PRIMARY CHARACTER SET	USASCII
SECONDARY CHARACTER SET	ROMAN8
LINES PER INCH	6
PAGE LENGTH	11
PERFORATION SKIP	<see operating systems>
TEXT LINES PER PAGE	<see operating systems>
LEFT MARGIN	3 (suggested)
RIGHT MARGIN	135 (suggested)
DISPLAY FUNCTIONS	off
HP TERMINAL MODE	off
RESTRICTED SEQUENCES	none
SECONDARY COMMANDS	on
LISTEN ALWAYS	off
SERVICE REQUEST	off
ADDRESS	1 (example)

The RS-232C version of the 2932A can be configured to act very much like a 2686A *LaserJet* (including DTR handshake); however, the RS-232C 2932A has never been tested with a Series 300 computer.

2932A/Series 300 BASIC Interfacing

PERFORATION SKIP	yes
LINES PER PAGE	60
Typical device specifier	`701`
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS	supported

HP-IB addresses above 7 are acceptable. Secondary commands may be disabled.

2932A/Series 300 HP-UX Interfacing

PERFORATION SKIP	off
LINES PER PAGE	66
Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	`2934a` (some options not meaningful)
DGL handler	`D0053, D0054`
Starbase handler	None

2932A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case Fold	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	1=Upper	1="NOCR"	1=RAW

Typical *mknod*s for 2932A at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

2932A/Series 300 HP-UX Considerations:

- "SECONDARY COMMANDS = yes" enables AMIGO protocol. In this mode HP-UX can pace the 2932A (time-share the bus) if the printer's HP-IB address is in the range 0...7. This mode is recommended if other devices are on the same HP-IB. With secondaries disabled, or with an HP-IB address above 7, HP-UX cannot pace the printer.
- In addition to the DGL vector handler, the 2932A can also print graphics raster data supplied by the *dump_graphics.c* command.

2932A/Series 300 Pascal Interfacing

PERFORATION SKIP	yes
LINES PER PAGE	60
Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump	supported

HP-IB addresses above 7 are acceptable. Secondary commands may be disabled.

2932A Ordering Information

2932A	200 cps printer, RS-232C interface
Option 046	Substitute HP-IB interface (required)
29085A	Interface upgrade kit - from any interface to RS-232C
Option 046	Substitute HP-IB for RS-232C
02932-90001	2932 Owner's manual
02932-90006	2932 Operator's manual
02932-90007	2932 Service manual
2932A+49A-00	Self-paced service training
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92154B	Replacement printhead
92155L	3-ribbon pack
92171G	Table-top paper catcher
92214P	Printer stand (w/paper catcher and casters)
92220R	0.3m right-angle HP-IB cable

2933A Printer

The 2933A is identical to the 2934A except that the 2933A lacks the 92188A Courier font cartridge standard in the 2934A. All other specifications, interfacing, support and considerations are the same. The 2933A is no longer supplied. Specify the 2934A.

2934A Printer

A 200 cps dot-matrix HP-IB impact printer for up to 15.75-in. wide paper. The 2934A is a good choice where near-letter-quality, medium speed, multi-part paper, bar code printing, large character printing or wide paper are required. The 2934A supports up to four plug-in font cartridges.

2934A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
2934A	RS-232C interface	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
Option 046	HP-IB interface	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
2934A#046	200 cps printer	Raster Dump	Vector or Raster Dump	Raster Dump	Raster Dump

2934A Specification Summary

Data sheet (for complete specifications)	5953-6278, -9457, -6286 (29340A)
Dimensions	185mmH, 600mmW, 365mmD
Weight	20.4 kg
Interface and command set	HP-IB (Option 046), PCL-3
Print speed	200 cps, bidirectional, optimized path
Character cell	9×12 (200 cps), 36×24 (67 cps)
Character sets	ROMAN8, KANA8, Linedraw, Math, Large Code39*, Ind2/5, Matrix2/5, Inter2/5, User-defined
Fonts	Courier and Cubic
Print pitches (cpi)	5.0, 10.0, 16.36
Line lengths (respectively)	68, 136, 223
Line spacing (lpi)	1, 2, 3, 4, 6, 8, 12
Character set	HP ROMAN8, KANA8, Linedraw, Math
Graphics density (dpi)	90×90
Paper width (min., max.)	57mm (2.25-in.), 400mm (8½-in.), fan-fold
Paper weights	15 to 100# single part 12# up to 6-part
AC voltage required	100, 120, 220, 240 +5/-10%
AC frequency tolerance	47.5 to 66 Hz
AC power required (idle, max.)	120 VA, 300 VA

2934A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Supplied
2934A#046	200 cps printer	1	0...30	1	N or H	0.0m	None

2934A/Series 300 Interfacing

BASIC, Pascal and HP-UX support the 2934A connected to either the built-in HP-IB or 98624A. When the AMIGO protocol of the 2934A is enabled, HP-UX also supports connection via the 98625 interface.

2934A Configuration Parameter	Sample Value
PRIMARY PRINT PITCH	10
SECONDARY PRINT PITCH	10
PRIMARY STYLE	Cubic
SECONDARY STYLE	Cubic
PRIMARY CHARACTER SET	USASCII
SECONDARY CHARACTER SET	ROMAN8
LINES PER INCH	6
PAGE LENGTH	11
PERFORATION SKIP	<see operating systems>
TEXT LINES PER PAGE	<see operating systems>
LEFT MARGIN	3 (suggested)
RIGHT MARGIN	135 (suggested)
DISPLAY FUNCTIONS	off
HP TERMINAL MODE	off
RESTRICTED SEQUENCES	none
SECONDARY COMMANDS	on
LISTEN ALWAYS	off
SERVICE REQUEST	off
ADDRESS	1 (example)

The RS-232C version of the 2934A can be configured to act very much like a 2686A *LaserJet* (including DTR handshake); however, the RS-232C 2934A has never been tested with a Series 300 computer.

2934A/Series 300 BASIC Interfacing

PERFORATION SKIP	yes
LINES PER PAGE	60
Typical device specifier	701
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS	supported

HP-IB addresses above 7 are acceptable. Secondary commands may be disabled.

2934A/Series 300 HP-UX Interfacing

PERFORATION SKIP	off
LINES PER PAGE	66
Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	`2934a`
DGL handler	`D0053, D0054`
Starbase handler	None

2934A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3**	**2**	**1**	**0**
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case Fold	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	1=Upper	1="NOCR"	1=RAW

Typical *mknod*s for 2934A at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

2934A/Series 300 HP-UX Considerations:

- "SECONDARY COMMANDS = yes" enables AMIGO protocol. In this mode HP-UX can pace the 2934A (time-share the bus) if the printer's HP-IB address is in the range 0...7. This mode is recommended if other devices are on the same HP-IB. With secondaries disabled, or with an HP-IB address above 7, HP-UX cannot pace the printer.
- In addition to the DGL vector handler, the 2934A can also print graphics raster data supplied by the *dump_graphics.c* command.

2934A/Series 300 Pascal Interfacing

PERFORATION SKIP	yes
LINES PER PAGE	60
Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump	supported

HP-IB addresses above 7 are acceptable. Secondary commands may be disabled.

2934A Ordering Information

2934A	200 cps printer, RS-232C interface
Option 046	Substitute HP-IB interface (required)
29086A	Interface upgrade kit - from any interface to RS-232C
Option 046	Substitute HP-IB for RS-232C
02932-90001	2932/34 Owner's manual
02932-90006	2932/34 Operator's manual
02932-90007	2932/34 Service manual
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
2932A+49A-00	Self-paced service training
29340S	Sheetfeeder
Option 010	Upgrade for printers earlier than 2419Axxxxx
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92154B	Replacement printhead
92155L	3-ribbon pack
92171G	Table-top paper catcher
92188A	Courier font cartridge (one included w/2934A)
92188B	Courier12 font cartridge
92188E	Helv font cartridge
92188G	OCR-A font cartridge
92188H	Italic font cartridge
92188M	Prestige Pica font cartridge
92188N	Prestige Elite12 font cartridge
92188R	Letter Gothic12 font cartridge
92188T	OCR-B font cartridge
92188U	Arabic8 font cartridge
92188V	Greek8 font cartridge
92188W	Turkish8 font cartridge
92188X	Hebrew7 font cartridge
92188Y	Hebrew8 font cartridge
92214P	Printer stand (w/paper catcher and casters)
92220R	0.3m right-angle HP-IB cable

Blank

30241A MAU

Refer to product 98643A.

35414CT Disc/Tape

Refer to product number 7914CT.

35721A/B/C 14-in. Video Monitor

The 35721 is a monochromatic (green) monitor for medium resolution text and graphics applications. The more economical 12-in. 35731 monitor (which accepts the 35723A *HP Touch* bezel and has a speaker) is recommended unless the additional 0.6-in. (diagonal) active screen area is a criterion. The 35721 is user-installable and is compatible with the following video interfaces:

- Built-in video output of the Model 310 processor board (98561-66511, -66512)
- 98542A medium resolution Series 300 monochromatic video board.
- 98546A Series 300 compatibility video interface.
- 98204B Series 200 monochromatic video interface.
- 35751M or 2393A Option 060 terminal processing unit.

35721/Series 300 Support Summary

Product	Description	Hardware Support	
		310	320
35721	14-in. monochromatic monitor	Yes	Yes

Host computer boot ROM and software support of the 35721 monitor depends on the video interface used. Refer to the 98561-66511, 98561-66512, 98542A and 98546A in this appendix.

35721 Specification Summary

Dimensions	332mmH, 340mmW, 340mmD
Weight	10.0 kg
Active display area	230mmW × 175mmH
Phosphor	Green P31, medium persistance
Interface	Composite video, phone jack
Polarity	negative sync
Level	1.0 V pk-pk (min.)
Input impedance	75 ohms
Video bandwidth	30 Hz to 23 MHz (±3 dB)
Scan frequency	24.90 KHz horiz., 50 or 60 Hz vert.
Active video period (max.)	29.8μs horiz., 15.67μs vert.
AC voltage required	100, 120, 230
AC frequency tolerance	48 to 66 Hz
AC power required (idle, max.)	50 Watts

35721/Series 300 Interfacing

Refer to host video output and/or interface cards: 98561-66511, 98561-66512, 98542A, 98546A. The 35721 includes no video cables.

35721 Ordering Information

35721A	14-in. Monitor, 120 Vac, 60 Hz
35721B	14-in. Monitor, 230 Vac, 50 or 60 Hz
35721C	14-in. Monitor, 100 Vac, 50 or 60 Hz
35721-90006	35721 User's Guide (one included w/35721)
35722A	Tilt/swivel base
5061-6534	19-in. EIA rack mount adaptor (requires 15.75-in. vertically)
92193V	CRT cleaning kit

35723A *HP Touch* Bezel

The 35723A is a user-installable bezel which adds touchscreen capability to the 35731 and 35741 12-in. video monitors. The 35723A uses an array of infra-red detectors to locate the position of objects as small as a pencil erasor. Physically touching the screen is not required. "Picking" occurs when you move the pointing object away from the screen. The 35723A is user-installable.

35723A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
35723A	Touchscreen	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
35723A	Used as ITE	Yes	Via *Starbase*	5.0	3.1
35723A	Used with 239x or HP 150-II	NA	5.0	5.0	NA

35723A Specification Summary

Data sheet (for complete specifications)	5953-8623
Weight	adds 0.5 kg to monitor
Interface and command set	HP-HIL, Graphics absolute
Resolution	57 H × 43 V
Row and column spacing	7.5mm
Scan rate	30 Hz max.
Pointing device tip diameter	10mm min.

35723A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Connectors	DC Power Required	Device Type	Cable Included
35723A	*HP Touch* bezel	1	2*	150mA typ. 200mA max.	Graphics Absolute	0.3m*

35723A/Series 300 Interfacing

The 35723A includes a short ribbon cable to connect it to the internal HP-HIL circuit of the supporting 35731 and 35741 monitors. The 35731/41 monitors do not include an external HP-HIL cable, and in general, one is required to connect the monitor to the link. The 35723A may be placed anywhere on the link.

All Series 300 operating systems presently support the 35723A only as a graphics device. BASIC, Pascal and HP-UX support the 35723A connected to the built-in HP-HIL of the Series 300 computer. HP-UX also supports the 35723A through the HP 150-II and 2393A terminals (although this is handled by the terminal and is transparent to the HP-UX system).

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* The link connectors are provided on the rear of the 35731 or 35741 monitor. The 0.3m cable is internal to the monitor. A separate HP-HIL cable is required to insert the 35723A in a link.

35723A/Series 300 BASIC Interfacing

Typical device specifier	`KBD` (or 2)
Binaries required	GRAPH, GRAPHX, KBD
Binaries optional	None
Programming required	`GRAPHICS INPUT IS KBD,"TABLET"`

Additional programming may be required if a tablet is also connected to the same HP-HIL interface.

35723A/Series 300 HP-UX Interfacing

Drivers required	`hil`
Drivers optional	`r8042`
Block-mode major number	NA
Character-mode major number	0 (console) 23 (r8042) 24 (hil)
DGL handler (terminals)	`L0019, V0019, P0019`
DGL handler (via *Starbase*)	`L0056, V0056, P0056`
Starbase handler	`/usr/lib/libddhil.a`

35723A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	Not Used	Location	Not Used
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 35723A as second device on Link.

```
# mknod /dev/r8042     b 23 0x000000
# mknod /dev/touch     b 24 0x000020
```

This is for a 35723A on the built-in HP-HIL. For a terminal, use the terminal minor number.

35723A/Series 300 Pascal Interfacing

Default volume	<none>
Modules required	HPHIL, A804XDVR, GRAPHICS (any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

35723A Ordering Information

35723A Option 001	Touchscreen bezel ZH1/618-compliant bezel insert
35723-90001	*HP Touch* Accessory Installation Guide (one included w/35723A)
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46080-61601	2.4m flat HP-HIL cable
46080A	2.4m HP-HIL extension (no audio)
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL/RGB extension (with audio)
46082B	30m HP-HIL/RGB extension (with audio)
46083-61601	0.5m flat HP-HIL cable
92193V	CRT cleaning kit

35731A/B 12-in. Video Monitor

The 35731 is a monochromatic (green) monitor for medium resolution text and graphics applications. It accepts the 35723A *HP Touch* bezel and has a built-in swivel base, tilt bezel and speaker. The 35731 is compatible with the following video interfaces:

- Built-in video output of the Model 310 processor board (98561-66511, -66512)
- 98542A medium resolution Series 300 monochromatic video board.
- 98546A Series 300 compatibility video interface.
- 98204B Series 200 monochromatic video interface.
- 35751M or 2393A Option 060 terminal processing unit (the 2393A includes a 35731).

The 35731 is also included with the 98580A bundled Series 300 system. The 35731 is user-installable.

35731/Series 300 Support Summary

Product	Description	Hardware Support	
		310	320
35731	12-in. monochromatic monitor	Yes	Yes

Host computer support of the 35731 monitor depends on the video interface used. Refer to 98561-66511, 98561-66512, 98542A and 98546A in this appendix.

35731 Specification Summary

Dimensions	332mmH, 340mmW, 240mmD
Weight	10.0 kg (12 kg shipping)
Active display area	219mmW × 164mmH
Phosphor	Green P31, medium persistance
Intensity	50 FL max., adjustable
Non-linearity	< 3%
Character size (10×15 cell)	3.7mmW, 4.9mmH
Video interface	1 v p-p, composite video, RCA phono jack
Polarity	negative sync
Input impedance	75 ohms
Video bandwidth	30 Hz to 24 MHz (±3 dB)
Scan frequency	Horizontal 24.90 to 25.8 KHz, Vertical 50 (16.67 ms) or 60 Hz (20.00 ms)
Audio interface	8 ohms, RCA phono jack
AC voltage required	35731A: 108 to 132 Vac, 60 Hz 35731B: 90 to 132 or 180 to 264 Vac
AC frequency tolerance	50 or 60 Hz
AC power required	45 Watts max.

35731/Series 300 Interfacing

Refer to host video output and/or interface cards: 98561-66511, 98561-66512, 98542A, 98546A.

If no 35723A *HP Touch* bezel is installed, a shorting plug (supplied) must be inserted in the front HP-HIL connector to maintain circuit continuity between the •• and • HP-HIL jacks on the rear of the display housing.

The 35731 does not include an HP-HIL cable. If you plan to connect any HP-HIL devices through the 35741's HP-HIL ports (with or without an *HP Touch* bezel present), you need to order an additional HP-HIL cable.

35731 Ordering Information

35731A	12-in. Monitor, 108-132 Vac, 60 Hz
35731BB	12-in. Monitor, European power cord
35731BK	12-in. Monitor, no power cord
35731BM	12-in. Monitor, U.S. power cord
35731BQ	12-in. Monitor, Swiss power cord
35731BU	12-in. Monitor, U.K. power cord
35731BY	12-in. Monitor, Danish power cord
35731-90001	35731 Installation Guide (half-size, one included w/35731)
35723A	*HP Touch* bezel
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46080-61601	2.4m flat HP-HIL cable
46083-61601	0.5m flat HP-HIL cable
5958-4344	98567A/B Installation Note (one included w/98567A/B)
98567A	19-in. EIA rack mount adaptor (requires 15.75-in. of rack space)
92193V	CRT cleaning kit

35741A/B 12-in. Color Monitor

The 35741 is a color monitor for medium resolution text and graphics applications. It accepts the 35723A *HPtouch* bezel and has a built-in swivel base, tilt bezel and speaker. The 35741 is compatible with the following video interfaces:

- 98543A medium resolution Series 300 color video board.
- 98546A Series 300 compatibility video interface.
- 35751C or 2397A Option 060 terminal processing unit (the 2397A includes a 35741).

The 35741 is also included with the 98581A bundled Series 300 system. The 35741 is user-installable.

35741/Series 300 Support Summary

Product	Description	Hardware Support	
		310	320
35741	12-in. color monitor	Yes	Yes

Host computer boot ROM and software support of the 35741 monitor depends on the video interface used. Refer to 98543A and 98546A in this appendix.

35741 Specification Summary

Data sheet (for complete specs.)	5953-8626
Dimensions	345mmH, 328mmW, 390mmD
Weight	13.9 kg (15.9 kg shipping)
Active display area	210mmW × 164mmH
Phosphor	P22
Intensity	36 FL max., adjustable
Non-lineraity	< 7%
Misconvergence	≤0.3mm (center), 0.5mm (corners)
Chromaticity coordinates	X: 0.63R, 0.30G, 0.15B Y: 0.35R, 0.60G, 0.06B
Character size (10×15 cell)	3.7mmW, 4.9mmH
AC voltage required	35741A: 90 to 132 Vac, 60 Hz 35741B: 90 to 132 or 180 to 264 Vac
AC frequency tolerance	50 or 60 Hz
AC power required	65 Watts max.

35741/Series 300 Interfacing

Refer to host video output and/or interface cards: 98542A and 98546A. The 35741 includes no video cables.

If no 35723A *HP Touch* bezel is installed, a shorting plug (supplied) must be inserted in the front HP-HIL connector to maintain circuit continuity between the •• and • HP-HIL jacks on the rear of the display housing.

The 35741 does not include an HP-HIL cable. If you plan to connect any HP-HIL devices through the 35741's HP-HIL ports (with or without an *HP Touch* bezel present), you need to order an additional HP-HIL cable.

35741 Ordering Information

35741A	12-in. Monitor, U.S. power cord
35741BA	12-in. Monitor, RSA power cord
35741BB	12-in. Monitor, European power cord
35741BK	12-in. Monitor, no power cord
35741BQ	12-in. Monitor, Swiss power cord
35741BU	12-in. Monitor, U.K. power cord
35741BY	12-in. Monitor, Danish power cord
35741-90000	35741 User's Guide (one included w/35741)
35723A	*HP Touch* bezel
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46080-61601	2.4m flat HP-HIL cable
46083-61601	0.5m flat HP-HIL cable
5958-4344	98567A/B Installation Note (one included w/98567A/B)
98567B	19-in. EIA rack mount adaptor (requires 15.75-in. rack space)
92193V	CRT cleaning kit
98560-90602	Installation card (one included w/98581A system)

37201A HP-IB Extender

The 37201A extends a single bus to unlimited distances using full duplex RS-232C/CCITT V.24 modems. 37201As are used in pairs (or more than two for multidrop configurations). Although the 37201A can also extend a bus up to 1000m using twisted pair wiring, the 37203A (coax/fibre optic) extender provides higher performance at lower cost in direct-connect configurations. The 37201A is not an RS-232C to HP-IB converter. It uses a sophisticated packet-with-error-check protocol on the serial link to assure reliable transfer of HP-IB commands and data. The 37201A is supplied in a full-width HP System-II enclosure.

37201A/Series 300 Support Summary

Although designed for connecting HP instruments and HP controllers, the 37201A has never been formally qualified as a computer peripheral on Series 300 computers (this is true of most HP-IB instruments).

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
37201A	HP-IB Extender	No	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

HP-IB handshake timeouts may occur at very low baud rates (<300 baud).

The 37201A does not support Parallel Poll (remote PPOLL) capability. It is therefore unlikely to work with any mass storage devices (AMIGO, CS/80, SS/80 or 797X) or paced printers (AMIGO, CIPER). The 2930-series printers may function if secondary commands are disabled. 2560-series printers may function if configured for non-CIPER operation.

The 37201A also does not support PASS CONTROL (send or accept TCT). Only one 37201A in the circuit should be connected to an *active controller*. Only the active controller is able to address the (local) 37201A in it's side of the circuit. Any remote controllers must act as *devices* (i.e. must be not-system-controller). The 37201A on the remote side is *transparent* to the devices/controllers on the remote side.

If remote PPOLL and PASS CONTROL are required, chose the 37203A.

No software is provided for auto-dialling.

37201A Specification Summary

Data sheet (for complete specifications)	5953-3246
Dimensions Weight	89mmH, 426mmW, 356mmD 5.7 kg (8.8 kg shipping)
Interface Data rates	HP-IB (controller and devices only) RS-232C, CCITT V.24 (modem datacomm only) RS-366, CCITT V.25 (autodialler only) 775 bytes/sec hardwired, 150, 300, 600, 1200 bps asynchronous, max. 38 bytes sec. (@1200 baud) to 19 200 bps synchronous, max. 744 bytes sec. (@19 200 baud)
AC voltage required AC frequency tolerance AC power required	100, 120, 220, 240 +10/-13% 48 to 66 Hz 30 VA max

37201A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
37201A	HP-IB extender	1	0...30	1	N	0.0m	None

37201A/Series 300 Interfacing

BASIC, Pascal and HP-UX provide full instrument HP-IB controller and/or device functionality only via the built-in HP-IB or 98624A, and not the 98625 (disc) interface. The following discussions assume a manually dialled 1200 baud modem configuration.

WARNING

DISCONNECT THE LINE CORD BEFORE REMOVING THE INSTRUMENT COVERS. HAZARDOUS VOLTAGES ARE PRESENT INSIDE WHEN AC POWER IS CONNECTED.

37201A Configuration Parameter	Local Sample Initial Value	Remote Sample Initial Value
HP-IB Address	17	18
Controller end	On	Off
SRQ	Off	Off
No flush on same TAD	Off	Off
No clear on IFC	Off	Off
No UNT on SPD	Off	Off
Multi-point	Off	Off
Data medium	1200 async	1200 async

The remote 37201A represents a "new" bus insofar as device loads and cabling distances are concerned. That is, subject to the limit of 30 total device addresses, you can have up to 14 devices connected to the remote 37201A.

No devices (on either the local or remote buses) should have the same addresses as either 37201A (or any devices on the same bus). Once connection is established between the 37201As, you may communicate with remote bus devices as if they were local devices. Addressing the bus extenders themselves is generally not required.

37201A/Series 300 BASIC Interfacing

Typical device specifier (local 37201A)	717
Binaries required	HPIB
Binaries optional	IO
Programming required	<none>

37201A/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21

37201A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1F	0

Typical *mknod* for addressing 37201A at select code 7, bus address 17

```
# mknod /dev/local37201  c 21 0x071100
```

37201A/Series 300 Pascal Interfacing

Default volume	<none>
Modules required	HP-IB (if 37201 addressed), otherwise depends on remote devices

37201A Ordering Information

37201A	HP-IB extender
Option 050	Special HP 1000 firmware (do not order for HP 9000 use)
Option 907	Front handle kit
Option 908	19-in. EIA Rack flange kit
Option 909	Option 907 and 908 combination kit
Option 910	Extra manual
37201-90001	37201 Operation and Service manual (one included w/37201A)
01645-61605	3m modem/dialler cable
10235-61606	1m modem/dialler cable
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
1251-3764	Twin pair cable connector (one set included w/37201A)
37212A	300/1200 bps auto-dial modem
8120-1187	Twisted pair cable (specify length)
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable

37203A HP-IB Extender

The 37203A extends a single bus to 1000m using twin coaxial or (optionally) fibre optic cable. 37203As are always used in pairs. For operation beyond 1000m (or over telephone lines), refer to the 37201A. There is a single-board version of the 37203A available for the HP 1000 A- and L-Series computers, the 37203L. It is compatible with the 37203A. The 37203A is supplied in a half-width HP System-II enclosure.

37203A/Series 300 Support Summary

Although designed for connecting HP instruments and HP controllers, the 37203A has never been formally qualified as a computer peripheral with any Series 300 computer (this is true of most HP-IB instruments).

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
37203A	HP-IB Extender	No	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

The 37203A supports Parallel Poll (remote PPOLL) capability. However, inserting a pair of 37203As in a between a controller and a device adds a minimum of 20μs delay to the remote device's response to the PPOLL request. Series 300 interfaces and drivers wait a (fixed) maximum time of 25μs for PPOLL response. None of the Series 300 operating systems provide direct control of the EOI bus line, so it is not possible to conduct a longer poll by direct interface control. The 37203A should not be used in applications which rely on PPOLL. It is also unlikely to work with any mass storage devices (AMIGO, CS/80, SS/80 or 797X) or paced printers (AMIGO, CIPER). The 2930-series printers may function if secondary commands are disabled. 2560-series printers may function if configured for non-CIPER operation.

The 37203A supports PASS CONTROL (send or accept TCT). You may have bus controllers on either side of the extended bus. Only one should be *system controller*. As remote IFC is also supported, the system controller can regain active control at any time.

37203A Specification Summary

Data sheet (for complete specifications)	5953-5403
Dimensions Weight	89mmH, 213mmW, 356mmD 3.1 kg (4.4 kg shipping)
Interface Data rates	HP-IB (controller and devices only) 50 kbytes/sec. max. 2.75 kbytes/sec. @ 1000m coax. 25 kbytes/sec. $1000m fibre optic
AC voltage required AC frequency tolerance AC power required	100, 120, 220, 240 +5/-10% 48 to 66 Hz 25 VA max

37203A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
37203A	HP-IB extender	None	NA	1	N	0.0m	None

37201A/Series 300 Interfacing

BASIC, Pascal and HP-UX provide full instrument HP-IB controller and/or device functionality only via the built-in HP-IB or 98624A, and not the 98625 (disc) interface. The 37203A is fully transparent to all bus operations (except PPOLL) and is not addressable. Apart from cabling considerations, the interface, driver and programming requirements depend entirely on the other devices on the local and remote buses.

The remote 37203A represents a "new" bus insofar as device loads and cabling distances are concerned. That is, subject to the limit of 30 total device addresses, you can have up to 14 devices connected to the remote 37203A.

No devices (on either the local or remote buses) should have the same addresses. Once connection is established between the 37201As, you may communicate with remote bus devices as if they were local devices.

37203A Ordering Information

37203A	HP-IB extender
Option 001	Adds fibre optic interface
Option 010	Powerfail option for use with HP3000
Option 301	Single 19-in. EIA rack mount adaptor
Option 302	Dual EIA rack mount kit (for two 37203As)
Option 910	Extra manual
Coax cable	Belden 9248, 75 ohm
BNC connector	Trompeter UPL 20-41
37203-90000	37203 Operation and Service manual (one included w/37203A)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
39200A	Simplex fibre optic cable (specify length in ft., two required)
Option 001	Length is in metres
39200B	Duplex fibre optic cable (specify length in ft.)
Option 001	Length is in metres
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable

37212A 1200 bps Modem

The 37212A is a Bell 212A/CCITT V.22 compatible modem for use at data rates of 0 to 300 and 1200 bits/sec. It may be used in auto-dial, auto-answer, manual connect and leased-line configurations. It is recommended for use outside the U.S. and Canada, as it is licensed for use in most countries which permit privately owned auto-dial modems. In the U.S. and Canada, the HP 92205A/C Hayes *Smartmodem 1200* is more economical.

37212A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
37212A	1200 bps modem	NOP	Planned	Planned	Unsup.*	5.0	Unsup.*

37212A Specification Summary

Data sheet (for complete specifications)	5953-5457
Dimensions	75mmH, 215mmW, 295mmD
Weight	2.3 kg (5.0 kg shipping)
Computer/terminal interface	RS-232C, CCITT V.24
Datacomm interface	Bell or U.K. modular jacks, 2-wire leased line
FCC ringer equivalence	1.0A
FCC registration number	ABA 979-12397-MD-E
Canadian DOT certification	466 710A
U.K. registration	S/1032/3/E/450352
Transmit level	-9 dBm max. (600 ohm)
V.22 mode guard tone	6 dB ± 1 dB below main power level
Connect methods	Pulse or DTMF (tone) dialling
Data rates (baud)	0 to 300 bps (Bell 103) 1200 bps (Bell 212A or CCITT V.22), asynchronous or synchronous (automatic speed detection)
Character length	9 or 10 bits, selectable
Configuration	commands and/or internal switches
Diagnostics	Local analog loopback, remote digital loopback, self-test
AC voltage required	100 to 120, 200 to 240 +5/-10%
AC frequency tolerance	49 to 66 Hz
AC power required (ave., max.)	15 VA max.

37212A/Series 300 Interfacing

The 37212A may be used with any Series 300 RS-232C interface, although it is not recommended for use with the three hard-wired ports of the 98642A Mux. The examples which follow assume that the 37212A is connected to an interface at select code 9.

---

* The 37212A has been tested with the Pascal-based HP 2392A terminal emulator software. However, neither BASIC nor Pascal provide any transparent software support for modems.

The suggested interface is any RS-232C interface cabled to provide a DTE connection, such as the built-in interface with 13242N or 92221M cable. The interface should be configured (if possible) for 1200 baud, 8 bits/character, no parity, Xon/Xoff handshake, modem status lines connected.

Host Connection	Peripheral Cable	Peripheral	Comments
DTE(M)	Implied	37212A	All configurations

WARNING

BE SURE TO DISCONNECT THE POWER CORD FROM THE MODEM WHENEVER YOU ARE WORKING WITH THE INTERNAL SWITCHES AND JUMPERS. LETHAL VOLTAGES ARE EXPOSED WHENEVER THE TOP COVER IS REMOVED FROM THE MODEM AND THE LINE CORD IS CONNECTED.

37212A Switch or jumper	Sample Configuration	Comments
HS	In	Defaults to 1200 bps operation
ALB	Out	Not in analog loopback mode
RDL	Out	Not in remote digital loopback mode
DATA	Out	Not forcing originate mode
S16	Open	"computer mode"
S15	Open	Enable modem commands
S14	Open	Bell 212A mode (your discretion)
S13	Open	Asynchronous mode
S12	Open	10-bit data (8 data, 1 start, 1 stop)
S11	Open	Auto-answer enabled (your discretion)
S10	Open	DSR/CTS/CD indicate line status
S9	Open	TR monitored (not forced true)
PIN12	Speed Indicate	Internal jumper
PIN23	Speed Select	Internal jumper
Line type	Dial-up	Internal jumper

37212A/Series 300 BASIC Interfacing

Typical device specifier	9
Binaries required	SERIAL or DCOMM (98628A)
Binaries optional	IO
Programming required	CONTROL 9,3;1200* (on 98644A or built-in RS232)

* This is the minimum programming required for modems setup in a leased-line configuration. Additional programming of interface control registers will probably be required before data can be transfered. Monitoring of status registers is also required for auto-answer and in applications using unreliable dial-up lines.

37212A/Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1
Autodialer	`ACUHP37212A` in *dialit.c*

37212A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
				Access Type			
Fields	Select Code	98642A port*	Not Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	00 to 03	0	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod*s for 37212A at select code 9

```
# mknod /dev/tty02  c 1 0x090001
# mknod /dev/cua02  c 1 0x090000
# mknod /dev/cul02  c 1 0x090001
```

37212A/Series 300 Pascal Interfacing

Default volume	None
Modules required	RS232 or DATA_COMM (98628A)
Modules optional	None
Programming required	Significant

37212A Ordering Information

37212A	Modem (U.S. firmware)
Option 001	+5 and ±12 VDC operation
Option 003	+5 and ±15 VDC operation
Option 010	U.K. firmware
Option 305	19 in. EIA rackmount kit (for 1 or 2 modems)
15561A	Bell-style 2.1m RJ-11C modular telephone cable
15562A	British Telecom 3m modular telephone cable
15563A	3m cable for spade terminals

* For 98642A Mux ports only. otherwise zero (0).

39800/01A Bar Code Readers

The 39800A and 39801A are general purpose RS-232C/V.24 stand-alone (or eavesdrop) bar code readers. The 39800A offers programmatic host control of reader status and configuration. The 39801A is a "transmit-only" switch-configured reader. These readers are identical to the 16800A and 16801A, respectively. Where programmability is not required, the 92916A HP-HIL bar code reader (supported by Series 300 mainframes and HP-HIL equiped terminals) is more economical.

39800/01A-Series 300 Support Summary

No Series 300 operating systems provide transparent support for the 39800/01A barcode readers. An Application Bulletin describes its use with BASIC.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
39800A	Barcode reader	No	Unsup.	Unsup.	4.0	Unsup.	Unsup.
39801A	Barcode reader	No	Unsup.	Unsup.	4.0	Unsup.	Unsup.

39800/01A Specification Summary

Data sheet (for complete specifications)	5954-2158, -2159, -2160
Dimensions (reader)	71mmH, 260mmW, 189mmD
Dimensions (wand)	20mmH, 132mmW, 23mmD
Wand cord length	0.71 to 1.83m
Weight	2.0 kg
Interface and command set	RS-232C, 39800A
Data rates (baud)	110, 300, 600, 1200, 2400, 4800, 9600 switch selectable
Handshaking	Xon/Xoff, DC1 trigger, RTS/CTS
Character frame	8 bits, 1 or 2 stop bits
Character delay	none or 30ms
Parity	odd, even, none, 1s, 0s
Terminator character	CR, HT, CR/LF or none
Output buffer	255 bytes
Configuration	internal switches
Standard bar codes	Ind. 2-of-5, Interleaved 2-of-5, 3-of-9 (USD-3, MIL-STD-1189), with or without checksum
Optional bar codes	UPC-A, UPC-E, EAN-8, EAN-13, JAN-8, JAN-13, with 2 or 5 digit supplements
AC voltage required	100, 120, 220, 240 +5/-10%
AC frequency tolerance	48 to 66 Hz
AC power required	20 VA max.

39800/01A-Series 300 Interfacing

The 39800/01A may be used with any Series 300 RS-232C interface at 300 baud. At speeds above 300 baud, some kind of flow control (pacing) is required. See each operating system section for details. The examples which follow assume that the 39800/01A is connected to an interface at select code 9.

The suggested interface for BASIC or Pascal is a 98628A interface cabled to provide a DCE connection (interface Option 002). HP-UX may provide other connections. The interface should be configured (if possible) for 2400 baud, 8 bits/character, no parity, Xon/Xoff handshake, modem status lines connected. Higher baud rates may be used with the 98628A and 98642A interfaces.

Host Connection	Peripheral Cable	Peripheral	Comments
98628A Option 002	13242N or 92218A	39800/01A	All configurations
Any DCE(F)	Standard	39800/01A	HP-UX only
DIR9(F)	92221P	39800/01A	HP-UX only
DIR25(F)	13242G	39800/01A	HP-UX only
DIR25(M)	<none>	39800/01A	HP-UX only

39800/01A Switches	Sample Configuration	Comments
Baud rate (2-0)	2400 (100)	
Parity (4-3)	0s (00)	
Stop bits (5)	1 (0)	
Character delay (6)	Enabled (1)	
Software handshake (8-7)	Xon/Xoff (01)	
Transmission mode (10-9)	Disable local echo Character mode (00)	
Terminator (12-11)	CR (00)	
Block mode terminator (13)	None (0)	Not used
Code select (16-14)	all (111)	Until configuration validated
Checksum (18-17)	all (11)	Your choice
2of5 label length (23-19)	Variable (00000)	

Although the 39800/01A was also designed to be used in conjunction with a terminal ("eavesdrop mode"), this configuration has not been tested with HP-UX. In any case, the 92911A, 92915A and 92916A bar code readers are more economical and easier to configure when used with a terminal.

39800/01A-Series 300 BASIC Interfacing

Typical device specifier	9
Binaries required	IO, SERIAL or DCOMM (98628A)
Binaries optional	TRANS
Programming required	See Application Bulletin 66

Application Bulletin 66 (5953-9373) describes both a 98628A and 98626A connection. Due to the lack of handshaking in BASIC, and the lack of buffering on the 98626A interface, the 98626A is limited to 1200 baud. This is not a problem on the 98628A. Although the 98644A and Series 300 built-in interfaces might also work with the 39800/01A, they have a similar potential to lose data at higher baud rates.

Data loss can be minimized or eliminated by: making sure that an input operation is always pending to accept the inbound data (e.g. TRANSFER), operating at the slowest acceptable data rate (e.g. 300 baud), and enabling the inter-character 30ms delay in the reader. Higher rates may be achieved once you have established that this base configuration is reliable.

39800/01A-Series 300 HP-UX Interfacing

Drivers required	tty
Block-mode major number	NA
Character-mode major number	1

39800/01A-Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
				Access Type			
Fields	Select Code	98642A port*	Not Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	00 to 03	0	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod* for 39800/01A at select code 9

```
# mknod /dev/lp39800/01  c 1 0x090005
```

39800/01A/Series 300 HP-UX Considerations:

- You should not attempt to use a stand-alone bar code reader as a *login* terminal, i.e. do not place a *getty* on the RS-232C port.
- The 39800/01A may not be operate at data rates above 1200 baud when connected to a 98626A, 98644A or built-in RS-232C interface if the system also contains a 98625A disc interface and 98620B DMA card. You may use higher data rates if you enable the 30ms inter-character delay at the bar code reader. This restriction does not apply to the 98628A or 98642A interface.
- The following shell commands in */etc/rc* should properly configure the RS-232 interface for bar code I/O:

```
nohup sleep 2000000000 < /dev/barcode/01 &
stty -parenb -enqak cs8 2400 -cstopb clocal ixon opost onclr < /dev/barcode
```

39800/01A-Series 300 Pascal Interfacing

Default volume	None
Modules required	RS232 or DATA_COMM (98628A)
Modules optional	None
Programming required	Extensive

Although it is possible to write a Pascal routine which would emulate the example BASIC programs in Application Bulletin 66, this has not been documented and is not trivial.

* For 98642A Mux ports only, otherwise zero (0).

39800/01A Ordering Information

39800A	Programmable bar code reader
39801A	Bar code reader
Option 001	Substitute UPC/EAN/JAN capability for Industrial 2-of-5
Option 002	Substitute Codabar capability for Industrial 2-of-5
Option 210	100 Vac operation
Option 222	220 Vac operation
Option 224	240 Vac operation
Option 320	Substitute industrial wand for polycarbonate wand
Option 420	Substitute hi-res. industrial wand for polycarbonate wand
Option 610	Add mounting kit
Option 910	Additional manual set
03075-40006	External wand holder
13242N	5m RS-232C cable to DCE host
16800-60010	Replacement saphire wand tip
16800-61000	Wall mount kit
16830A	Standard polycarbonate bar code wand
16832A	High resolution polycarbonate bar code wand
16840A	Standard industrial polycarbonate bar code wand
16842A	High resolution industrial polycarbonate bar code wand
39800-90001	Operating and installation manual (one included w/39800/01)
39800-90004	Addendum for Option 001 readers
39800-90006	Addendum for Option 002 readers
5953-7732	Application Note 1013: "Elements of a Bar Code System"
5953-9373	Application Bulletin 66: "39800/01A ... Configuration Guide for Series 200.."
92911-90101	thru -90110 Pre-printed 3 of 9 bar code labels
92911-90111	thru -90120 Pre-printed 2 of 5 bar code labels
92218A	15m RS-232C cable to DCE host

45462B *Picture Perfect*™

Picture Perfect™ is an interactive software package for the creation of bar, pie, line and bar/line charts. It is a stand-alone software product which includes an execute-only Pascal 3.0 environment.

45462B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45462B	*Picture Perfect*™	Rev. A	Yes*	No	NA	NA	Note

45462B Specification Summary

Data sheet (for complete specifications)	5953-9546
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	1.3 Mbytes
Supported peripherals:	
Mass Storage	Any supported by Pascal 3.0
Printers	Graphics printing tested on: 2225A, 2631G, 2671G, 2673A, 2686A, 2932A, 2934A, 82906A, 9876A
Plotters	7470A#002, 7475A#002, 7550A, 7580A/B, 7585A/B, 7586B, 9872B/C/T/S
Human input	46060A Mouse, 46083A Knob
Security	HP-IB *SOFTKEY*

45462B *SOFTKEY* HP-IB Characteristics

The *SOFTKEY* must be "piggy-backed" on an available HP-IB connector on the built-in or 98624A HP-IB interface, and *not* a 98625.

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable
45462B	Security *SOFTKEY*	0	None	1	N or H	0.0m

45462B/Series 300 Pascal Interfacing

Linking and executing *Picture Perfect*™ as a normal Pascal ".CODE" file in Pascal 3.1 has not been tested. The HP-IB *SOFTKEY* would still be required.

45462B Ordering Information

45462B	*Picture Perfect*™
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 655	Software on 5¼-in. flexible disc
35159A	HP *HelpLine* certificates (package of five)

Picture Perfect is a trademark of Computer Support Corporation.

* Because *Picture Perfect*™ includes a Pascal 3.0 environment, it presently requires the 98546A video compatibility interface and a 12 or 14-in monitor (monochromatic or color). Peripheral support is also limited to that provided by Pascal 3.0.

45463B *Diagraph*™

Diagraph™ is an interactive software package for the creation of arbitrary chart and graphs. It includes a library of over 1600 symbols. It is a stand-alone software product which includes an execute-only Pascal 3.0 environment.

45463B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45463B	*Diagraph*™	Rev. A	Yes*	No	NA	NA	Note

45463B Specification Summary

Data sheet (for complete specs.)	5953-9546
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	1.3 Mbytes
Supported peripherals:	
Mass Storage	Any supported by Pascal 3.0
Printers	Graphics printing tested on: 2225A, 2631G, 2671G, 2673A, 2686A, 2932A, 2934A, 82906A, 9876A
Plotters	7470A#002, 7475A#002, 7550A, 7580A/B, 7585A/B, 7586B, 9872B/C/T/S
Human input	46060A Mouse, 46083A Knob
Security	HP-IB *SOFTKEY*

45463B *SOFTKEY* HP-IB Characteristics

The *SOFTKEY* must be "piggy-backed" on an available HP-IB connector on the built-in or 98624A HP-IB interface, and *not* a 98625.

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable
45463B	Security *SOFTKEY*	0	None	1	N or H	0.0m

45463B/Series 300 Pascal Interfacing

Linking and executing *Diagraph*™ as a normal Pascal ".CODE" file in Pascal 3.1 has not been tested. The HP-IB *SOFTKEY* would still be required.

45463B Ordering Information

45463B	*Diagraph*™
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 655	Software on 5¼-in. flexible disc
35159A	HP *HelpLine* certificates (package of five)

Diagraph is a trademark licensed to Computer Support Corporation.

* Because *Diagraph*™ includes a Pascal 3.0 environment, it presently requires the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color). Peripheral support is also limited to that provided by Pascal 3.0, in particular, the 46087/88A digitizers are not yet supported.

45481B *Context MBA*™

Context MBA™ is an interactive spreadsheet with graphics, datacomm, word processing, database management, forms and windowing capabilities. It is a stand-alone software product which includes an execute-only Pascal 3.0 environment.

45481B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45481B	*Context MBA*™	Rev. A	Yes*	No	NA	NA	Note

45481B Specification Summary

Data sheet (for complete specs.)	5953-9513
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	1.0 Mbytes
Supported peripherals:	
Mass Storage	Any supported by Pascal 3.0 plus one of the following for the MBA3 disc: 9121D/S or equivalent drive built into a 9133A/B/V/XV, 9122D/S or equivalent drive built into a 9133D/H, 9130K/31G, 82901M
Printers	The following were tested: 2225A, 2602A, 2631G, 2671G, 2686A, 2932A, 2934A, 82905B, 82906A, 9876A
Plotters	7470A#002, 7475A#002, 7550A, 7580A/B, 7585A/B, 7586B, 9872C/T
Datacomm	98626A, 98644A, 92205A/C
Security	Disc MBA3 is copy-protected and must be present while MBA is running. Two MBA3 discs are included.

45481B/Series 300 Pascal Interfacing

Context MBA™ may *not* be linked and executed as a normal Pascal ".CODE" file in Pascal 3.0 or 3.1.

45481B Ordering Information

45481B	*Context MBA*™
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 650	Software on 5¼-in. flexible disc (external interleave)
Option 655	Software on 5¼-in. flexible disc (internal interleave)
35159A	HP *HelpLine* certificates (package of five)

Context MBA is a trademark of Context Management Systems, Inc.

* Because MBA includes a Pascal 3.0 environment, it presently requires the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color). Peripheral support is also limited to that provided by Pascal 3.0.

45537B Graphics Editor/200

Graphics Editor/200 is a menu-driven interactive screen-oriented package for the creation and maintenance of arbitrary graphics images. It is a stand-alone software product which includes an execute-only Pascal 3.0 environment.

45537B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45537B	Graphics Editor/200 2.0	Rev. A	Yes*	No	NA	NA	Note

45537B Specification Summary

Data sheet (for complete specifications)	5953-5887
RAM required (total, stand-alone)	768 Kbytes
Disc space used (as supplied)	800 Kbytes
Supported peripherals:	
Mass Storage	Any supported by Pascal 3.0
Plot-to-file	Local or SRM files
Plotters	7470A#002, 7475A#002, 7550A, 7580A/B, 7585A/B, 7586B, 9872B/C/T/S
Printers	Raster graphics dump tested on: 2225A, 2631G, 2671G, 2673A, 2932A, 2934A, 82905B, 82906A, 9876A
Human input	46060A Mouse, 9111A tablet

45537B/Series 300 Pascal Interfacing

Linking and executing Graphics Editor/200 as a normal Pascal ".CODE" file in Pascal 3.1 has not been tested.

45537B Ordering Information

45537B	Graphics Editor/200
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 650	Software on 5¼-in. flexible disc (external interleave)
Option 655	Software on 5¼-in. flexible disc (internal interleave)
35159A	HP *HelpLine* certificates (package of five)

* Because Graphics Editor/200 includes a Pascal 3.0 environment, it requires the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color). Similarly, peripheral support is limited to that provided by Pascal 3.0, in particular, the 46087/88A digitizers are not yet supported.

45538B Text Editor/200

Text Editor/200 is an interactive screen-oriented editor for the creation and maintenance of arbitrary text files. It is written in BASIC and requires that you have a BASIC Language System.

45538B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45538B	Text Editor/200	Rev. A	Yes*	Yes*	4.0	NA	NA

45538B Specification Summary

Data sheet (for complete specs.)	5953-5888
Text file types	BASIC "ASCII" Pascal ".ASC" LIF "ASCII"
Operating system required RAM required (total, including BASIC) Disc space used (as supplied)	BASIC 4.0 512 Kbytes 270 Kbytes
Supported peripherals: Mass Storage Printers	 Any supported by BASIC 4.0, including SRM Any supported by BASIC 4.0 should suffice for simple print & space. Text enhancements (e.g. underline) have been tested on the following: 2225A, 2601A, 2602A, 2631B/G, 2671G, 2673A, 2932A, 2933/34A, 82905B, 82906A, 9876A

45538B/Series 300 BASIC Interfacing

Text Editor/200 is an ordinary BASIC program and is supplied in source form.

45538B Ordering Information

45538B	Text Editor/200
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 650	Software on 5¼-in. flexible disc (external interleave)
Option 655	Software on 5¼-in. flexible disc (internal interleave)
35159A	HP *HelpLine* certificates (package of five)

* Text Editor/200 presently requires the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color).

45610A/B *TouchScreen* PC/Terminal

The 45610A/B is a monochromatic graphics terminal with detached keyboard and 10-in. CRT monitor. It has been replaced by the 45850A HP 150-II PC/terminal.

45610A/B/Series 300 Support Summary

The 45610 *TouchScreen* is a ROM-based 2623A terminal emulator. HP-UX support is limited to 2623A features.

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
45610	Graphics terminal	Rev. A	Yes	Yes	Unsup.	5.0	Unsup.
Suffixes BA...BZ	localized keyboards	NA	Yes	Yes	Unsup.	5.0	Unsup.

The 45610 should be configured to "ID" as a 2623A for DGL and *Starbase* use. Graphics output specified in absolute (e.g. mm) units is scaled due to the smaller size of the 45610 screen compared to the 2623A.

Product	Description	Hardware Support 310	Hardware Support 320	Graphics Software Support BASIC Graphics	Graphics Software Support HP-UX DGL	Graphics Software Support HP-UX *Starbase*	Graphics Software Support Pascal DGL
45610	As 2623A emulator	Yes	Yes	No	5.0	5.0	No

45610/Series 300 Interfacing

The 45610 is compatible with all Series 300 RS-232C interfaces as an alphanumeric terminal, but the buffered 98642A and 98628A are recommended for DGL and *Starbase* graphics. Refer to the interface card discussions for information about the interface side of the connection. The 45610-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	13242M (5m) or 13242N (5m) or 92218A (15m) or 92222M (.2m)	HP 150 port 1 or port 2
DIR25(M)	None	HP 150 port 1 or port 2

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

45610/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required (alpha)	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Interface required (graphics)	98642A or 98628A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2623, hp150, 150`
DGL handlers	`A0001, B0001, D0019, K0001, L0019, P0019, V0019`
Starbase handler	`/usr/lib/libdd262x.a`

45610/Series 300 HP-UX Considerations:

- When used as a personal computer, it is possible to transfer files between the *Touchscreen* and your HP-UX system. An unsupported royalty-free program *(KERMIT)*, available for both MS-DOS and UNIX*-like systems provides this capability. Contact your local HP-UX or UNIX* user's group, or:

  KERMIT Distribution
  Columbia University Center for Computing Activities
  612 West 115th Street
  New York, NY 10025

- The 98642A or 98628A interfaces are recommended if a 98625A interface is also present in the system.
- The 45610 may work as a graphics output device with the buffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.

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* UNIX is a trademark of AT&T Technologies.

45710A *The Portable* PC

The *Portable* (or HP 110) is a battery operated personal computer. It is also a ROM-based terminal emulator and includes a built-in 300 bps modem (except for certain export versions). As a terminal, its capabilities are similar to the HP 2621B, except that it has a 16-line screen. The 45711B *Portable Plus* has a 25-line display and (optionally) full 2622A emulation. The *Portable* is user-installed.

Portable/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45710A	*Portable* PC/terminal	No	Yes	Yes	Unsup.	5.0	Unsup.
Suffixes AL..BZ	Localized keyboards	No	Yes	Yes	Unsup.	5.0	Unsup.

The *Portable* is not suitable as a system console. The boot ROM cursor addressing results in an unintelligible display. The *Portable*'s terminal emulation does not include graphics. It is not supported as a graphics display by DGL or *Starbase*.

Portable Specification Summary

Data sheet (for complete specifications)	5954-1073
Dimensions (closed)	70mmH, 320mmW, 250mmD
Weight	8.35 kg
Screen size	9-in. diagnonal
Phosphors	Black on white LCD
Screen capacity	16 lines × 80 columns
Character resolution	5×7
Graphics resolution	480×128 (not supported by HP-UX)
Softkeys	8, programmable
Character sets	HP ROMAN8
Display enhancements	Inverse, underline
Command sets	HP
Interface	RS-232C, Bell 103 modem (RJ-11C)
Data rates (bps)	110, 134.5, 300, 600, 1200, 2400, 4800, 9600, 19200 via RS-232C 110 and 300 via built-in modem
Handshaking	Xon/Xoff, Enq/Ack
Character frame	6, 7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, saved in a RAM file
AC voltage required	depends on AC adaptor
AC power required (max.)	3 VA

Portable/Series 300 Interfacing

The *Portable* is compatible with all Series 300 RS-232C interfaces. Refer to the interface card discussions for information about the interface side of the connection. The 45710A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	92221M (1.5m)	45710A RS-232C port
DIR25(F)	92221P (1.5m)	45710A RS-232C port

The *Portable*'s built-in terminal emulator always employs a full-duplex modem handshake when used with the 92221M cable. In a non-modem configuration, make sure that the "DCE(F)" connection has the modem control lines present. Series 300 host connections using the 5061-4216 DCE cable or the 13232U modem eliminator cable meet this criteria. Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

Portable/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`hp110, 110`

45710A/ Series 300 HP-UX Considerations:

- The *Portable* includes an ASCII file transfer capability using the MODEM7 protocol. An unsupported public-domain program *(umodem)*, available for UNIX*-like systems, is compatible with this protocol. Contact your local HP-UX or UNIX* user's group.
- The 98642A or 98628A interface are recommended for 9600 baud connections if there is also a 98625A interface in the system.

* UNIX is a trademark of AT&T Technologies.

Portable **Ordering Information**

45710A	The *Portable* Computer (U.S. keyboard & charger)
45710AL	English-Canadian version
45710BD	German version (no built-in modem)
45710BF	French AZERTY version (no built-in modem)
45710BK	Universal English version
Option 010	U.S. recharger
Option 011	U.K. recharger
Option 012	Australian recharger
Option 013	European recharger
Option 014	R.S.A. recharger
45710BN	Norwegian version (no built-in modem)
45710BS	Swedish version (no built-in modem)
45710BY	Danish version (no built-in modem)
45710BZ	Italian version (no built-in modem)
45710A+49A	Self-paced hardware maintenance training
82059D	U.S. recharger
92221M	1.5m DTE (modem) cable
92221P	1.5m direct-connect cable

45711A *Portable Plus* PC

The *Portable Plus* is a battery operated 80C85-based personal computer. It is optionally a ROM-based 2622A terminal emulator. A plug-in 300/1200 bps modem is available. The *Portable Plus* is user-installed.

Portable Plus/Series 300 Support Summary

The *Portable Plus* must be equipped with the 82861K Option 400 PC2622 emulator software installed in an 82982A software drawer to be supported as a terminal. The 82983A internal modem is optional.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45711A, AL...BZ	*Portable Plus* PC/terminal	Unsup.	Yes	Yes	Unsup.	Inves.	Unsup.

RAM-based terminal emulators (such as the 98791B) are not supported as HP-UX system consoles. The *Portable Plus*' terminal emulation does not include graphics. It is not supported as a graphics display by DGL or *Starbase*.

Portable Plus Specification Summary

(as terminal, using 82861K Option 400 software)

Data sheet (for complete specifications)	5954-2485
Dimensions (closed)	70mmH, 320mmW, 250mmD
Weight	4.1 kg (minimum system)
Screen size	10-in. diagnonal
Phosphors	Black on white LCD
Screen capacity	25 lines × 80 columns
Character resolution	5×7
Graphics resolution	480×200 (not supported by HP-UX)
Softkeys	8, programmable
Character sets	HP ROMAN8
Display enhancements	Inverse, underline
Command sets	HP (modem is Hayes-compatible)
Interface	RS-232C DIR9(F) built-in modem optional
Data rates (bps)	110, 134.5, 300, 600, 1200, 2400, 4800, 9600, 19200 via RS-232C
Handshaking	Xon/Xoff, Enq/Ack
Character frame	6, 7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, saved in a RAM file
AC voltage required	depends on adaptor
AC power required (max.)	3 VA
Battery life (operating)	20 hrs. max. on full charge

Portable Plus/Series 300 Interfacing

The *Portable Plus* is compatible with all Series 300 RS-232C interfaces. Refer to the interface card discussions for information about the interface side of the connection. The 45711A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	92221M (1.5m)	45711A RS-232C port
DIR25(F)	92221P (1.5m)	45711A RS-232C port

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

Portable Plus/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2622, hp2622`

45711A/Series 300 HP-UX Considerations:

- The *Portable Plus* PC2622 emulator includes an ASCII file transfer capability using the XMODEM protocol. An unsupported public-domain program *(umodem)*, available for UNIX*-like systems, is compatible with this protocol. Contact your local HP-UX or UNIX* user's group.
- The 98642A or 98628A interface are recommended for 9600 baud connections if there is also a 98625A interface in the system.

* UNIX is a trademark of AT&T Technologies.

Portable Plus **Ordering Information**

45711A	The *Portable Plus* Computer (U.S. keyboard & charger)
45711AD	German version
45711AF	French AZERTY version
45711AK	Universal English version
Option 010	U.S. recharger
Option 011	U.K. recharger
Option 012	Australian recharger
Option 013	European recharger
Option 014	R.S.A. recharger
45711AL	English-Canadian version
45711AN	Norwegian version
45711AS	Swedish version
45711AY	Danish version
45711AZ	Italian version
13269U	Leather carrying case
45711A+49A	Self-paced hardware maintenance training
82059D	U.S. recharger
82066B	European recharger
82067B	U.K. recharger
82068B	Australian recharger
82861K	PC2622 terminal emulation software
Option 400	Software in *Portable Plus* ROM
82982A	Software drawer (required for 82861K Opt. 400 software)
92205D	Portable acoustic coupler
92221M	1.5m DTE (modem) cable
92221P	1.5m direct-connect cable

45850A *Touchscreen-II* PC/Terminal

The *Touchscreen-II* (or HP 150-II) is a monchromatic graphics terminal. The *Touchscreen-II* is a good choice if you require HP 9000-supported graphics terminal capability in a personal computer. The *Touchscreen-II* is user-installable.

Touchscreen II/Series 300 Support Summary

The 45610 *TouchScreen* is a ROM-based 2623A terminal emulator. HP-UX support is limited to 2623A features.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
45850A	*Touchscreen II* PC/terminal	Rev. A	Yes	Yes	Unsup.	5.0	Unsup.
	Localized keyboards	Rev. A	Yes	Yes	Unsup.	5.0	Unsup.

The 45850A should be configured to "ID" as a 2623A for DGL and *Starbase* use. The 45850A supports HP-HIL devices only when acting as a PC under local program, control. As a terminal, most local HP-HIL devices are not supported and generate no I/O data.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
45850A	As 2623A emulator	Yes	Yes	No	5.0	5.0	No

Touchscreen II Specification Summary

Dimensions (SPU)	342mmH, 325mmW, 370mmD
(keyboard)	refer to 46020A
Weight	14.41 kg
Screen size	12-in. diagnonal
Refresh rate	60 Hz
Phosphor	P31 Green
Screen capacity	27 lines × 80 columns Lines 25..27 for status/labels
Character resolution	6×9 ½-dot shifted in 8×14 cell
Graphics resolution	512×390
Softkeys	8, programmable
Character sets	HP ROMAN8, linedraw, math
Display enhancements	Inverse, underline, blinking, half-bright, security
Command sets	HP
Interface	2×RS-232C, built-in modem optional
Data rates (bps)	110, 134.5, 300, 600, 1200, 2400, 4800, 9600, 19200 via RS-232C
Handshaking	Xon/Xoff (host & device), Enq/Ack (device), DTR, RR/SRR, CTS
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery-backed
AC voltage required	115 Vac (+10,-25%), 230 Vac (+10,-15%)
AC frequency tolerance	47.5 to 63 Hz
AC power required (max.)	159 VA

Touchscreen II/Series 300 Interfacing

The *Touchscreen II* is compatible with all Series 300 RS-232C interfaces. Refer to the interface card discussions for information about the interface side of the connection. The 45850A-side connections are as follows:

Host Connection	Terminal Cable	Terminal Connection
DCE(F)	92222M (.25m) or 13242N (5m) or 92218A (15m)	45850A either port
DIR25(M)	None	45850A either port

Only HP-UX provides software for transparent support of terminals. Use of a terminal in BASIC or Pascal requires user programming.

Touchscreen II/**Series 300 HP-UX Interfacing**

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2623, hp2623, 150, hp150`
DGL handlers	`A0001, B0001, D0019, K0001, L0019, P0019, V0019`
Starbase handler	`/usr/lib/libdd262x.a`

45850A/ Series 300 HP-UX Considerations:

- When used as a personal computer, it is possible to transfer files between the *Touchscreen* and your HP-UX system. An unsupported royalty-free program *(KERMIT)*, available for both MS-DOS and UNIX*-like systems provides this capability. Contact your local HP-UX or UNIX* user's group, or:
  KERMIT Distribution
  Columbia University Center for Computing Activities
  612 West 115th Street
  New York, NY 10025
- The 98642A or 98628A interface are recommended for 9600 baud connections if there is also a 98625A interface in the system.
- The *Touchscreen-II* may work as a graphics output device with the unbuffered RS-232C interfaces (built-in, 98626A, 98644A) if the "spooling bit" is set in the application program to inhibit readback from the terminal.

* UNIX is a trademark of AT&T Technologies.

Touchscreen II **Ordering Information**

45850A	*Touchscreen II* Computer (U.S. keyboard)
13242N	5m DTE (U.S. modem cable)
35723A	HP-HIL *HP Touch* bezel
45847-90005	Using Your Touchscreen-II PC (one included w/45850A)
46080A	HP-HIL 2.4m extension
92222M	0.2m DTE cable
92218A	15m DTE cable
92916A	HP-HIL bar code reader

46020-Series HP-HIL Keyboards

These keyboards are offered in 17 languages and are supported by HP 9000 Series 300 mainframes, Series 200 Model 217, 237 (optionally Model 220) mainframes, the HP 98700H graphics display station, the HP 2393A graphics terminal and *Touchscreen-II* computer.

All 46020-series keyboards (except 46020AJ Katakana) can generate all HP ROMAN8 characters with the assistance of the Extend Char key. The Extend Char key mapping is shown after the specifications summary. The 46020 is customer installable.

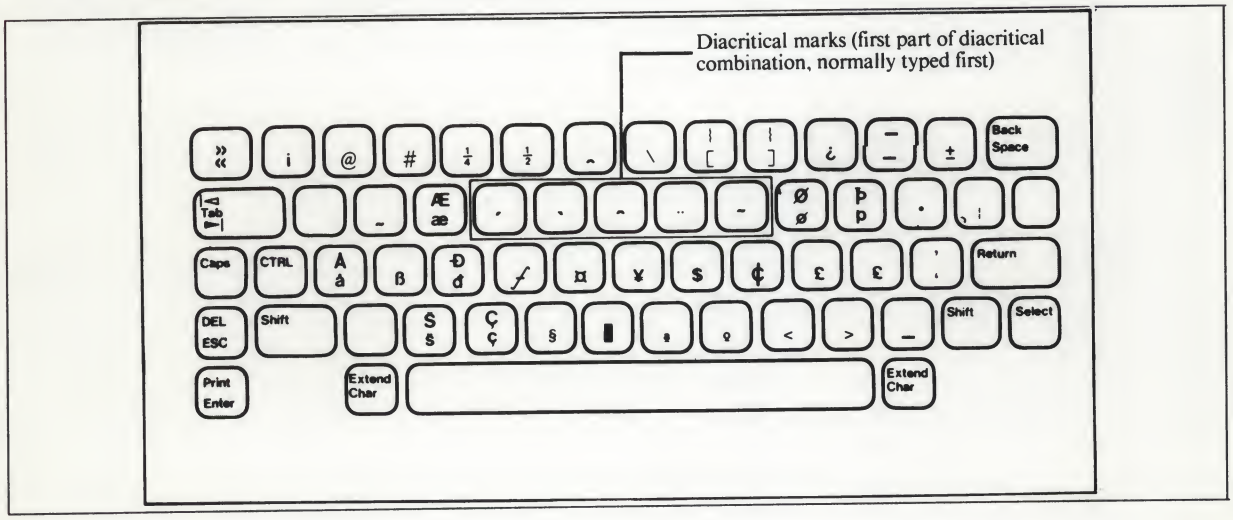
46020/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46020A-AZ	HP-HIL keyboards	Rev. A	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
46020A	Used with ITE	4.0	Via *Starbase*	5.0	3.1
46020A	Used with 239x terminal	NA	5.0*	5.0*	NA

46020 Specification Summary

Data sheet (for complete specs.)	5953-9584
Dimensions (standing)	63mmH, 456mmW, 225mmD
(flat)	35mmH, 456mmW, 225mmD
Weight	2.14 kg
Auto-repeat	after 0.5 sec.
N-key rollover	Yes



* When used with a terminal, arrow key resolution is limited to the terminal's display resolution (typically 512×390).

46020 HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Required	Device Type	Cable Included
46020A-AZ	Keyboard	1	2	90mA	Keyboard	None

46020/Series 300 Interfacing

The 46020 may be used with any Series 300 mainframe HP-HIL interface. The HP-HIL interface of the 98700H display station is supported only by BASIC and then only on the Model 320 with the 98561-66530 human interface card removed. The 46020 should be connected as the first keyboard on the link (e.g. "upstream" of a 92916A bar code reader).

The operating systems establish their (single) keycode-to-character code translation tables based on the first "keyboard" device encountered on the Link. For example, if you have a 92916A bar code reader (which can identify in several languages) "upstream" of the 46020, your keystrokes on the 46020 may produce unexpected characters.

Similarly, if you have two (or more) 46020 keyboards (as in a text translation application), the system will properly translate keycodes only for the first keyboard encountered. It is also not possible in BASIC, Pascal or HP-UX "cooked mode" to determine which keyboard is presently in use. Your application software must independently (via some operator action) determine the originating keyboard and perform a re-translation for characters entered via the second keyboard.

Host Connection	Peripheral Cable	Peripheral	Comments
98561-66530 or Model 310 built-in HP-HIL interface	46020-60001, 46080-61601, or 46083-61601	46020A-AZ	46020-60001 is supplied with Model 310 and 320 computers

46020/Series 300 BASIC Interfacing

BASIC 4.0 supports the 46020-series keyboards in their "native" mode and in a 98203B-emulation mode. The BASIC 4.0 keyboard overlay also includes 98203B keymapping.

Typical device specifier	`KBD` (or 2)
Binaries required	None
Binaries optional	LEX, KBD
Programming required	None

46020/Series 300 HP-UX Interfacing

The following data is for mainframe-interfaced keyboards only. Refer to the terminal's section when the keyboard is used with a terminal.

Drivers required	`console`
Drivers optional	`r8042, hil`
Block-mode major number	NA
Character-mode major number	0 (console) 23 (r8042) 24 (hil)
DGL handlers (terminal)	`B0001, K0001, L0019, V0019, P0019`
DGL handlers (via *Starbase*)	`B0056, L0056, V0056, P0056`
Starbase handler	`/usr/lib/libddhil.a`

46020/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	Not Used	Location	Not Used
Console (hex)	00	0	0	0
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 46020 as first device on Link.

```
# mknod /dev/console   c 0   0x000000
# mknod /dev/r8042     c 23  0x000000
# mknod /dev/rkbd      c 24  0x000010
```

46020/Series 300 Pascal Interfacing

Default volume	2 (SYSTERM:)
Modules required	HPHIL, A804XDVR
Modules optional	NONUSKBD1, NONUSKBD2, KEYS

46020 Ordering Information

46020A	U.S. English keyboard (*Note* - keyboards ordered separately do not include a cable.)
46020AC	French-Canadian keyboard
46020AD	German keyboard
46020AE	European Spanish keyboard
46020AF	French AZERTY keyboard
46020AH	Dutch keyboard
46020AJ	Katakana keyboard
46020AL	English Canadian keyboard
46020AM	Latin Spanish keyboard
46020AN	Norwegian keyboard
46020AP	Swiss-German keyboard
46020BP	Swiss-German keyboard (for BASIC 4.0, HP-UX 5.0, Pascal 3.1 and later)
46020AQ	Swiss-French keyboard
46020BQ	Swiss-French keyboard (for BASIC 4.0, HP-UX 5.0, Pascal 3.1 and later)
46020AS	Swedish keyboard
46020AU	U.K. English keyboard
46020AW	Flemish/Belgian keyboard
46020AX	Finnish keyboard
46020AY	Danish keyboard
46020AZ	Italian keyboard
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46020-90001	HP-HIL Keyboard User's Guide (one included w/46020A-AZ)
46080-61601	2.4m flat HP-HIL cable
46080A	2.4m HP-HIL extension (no audio)
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL extension (with audio)
46082B	30m HP-HIL extension (with audio)
46083-61601	0.5m flat HP-HIL cable
92171J	Keyboard park

46060A HP Mouse

The 46060A is a two-button mouse and is useful for pointing and picking in graphics or screen-oriented text processing applications. The 46060A is user-installable.

46060A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46060A	HP-HIL mouse	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
46020A	Used with ITE	4.0	Via *Starbase*	5.0	3.1
46020A	Used with 239x terminal	NA	5.0*	5.0*	NA

46060A Specification Summary

Data sheet (for complete specs.)	5953-9584
Dimensions	35mmH, 64mmW, 105mmD
Weight	0.2 kg
Cable length	1.4m, flat

46060A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Required	Device Type	Cable Included
46060A	HP Mouse	1	0	200mA	Graphics Relative	1.7m, flat

46060A/Series 300 Interfacing

The 46060A may be used with any Series 300 mainframe HP-HIL interface. The HP-HIL interface of the 98700H display station is supported only by BASIC and then only on the Model 320 with the 98561-66530 human interface card removed. The 46060A must be the last device on the link. It has no HP-HIL jacks and its cable is non-detachable (at the mouse end).

Host Connection	Peripheral Cable	Peripheral
98561-66530 or Model 310 built-in HP-HIL interface	Supplied	46060A

* When used with a terminal, resolution is limited to the terminal's display resolution (typically 512×390).

46060A/Series 300 BASIC Interfacing

Typical device specifier	KBD (or 2)
Binaries required	KBD
Binaries optional	GRAPH, GRAPHX
Programming required	None
Programming optional	GRAPHICS INPUT IS KBD,"KBD"

46060A/Series 300 HP-UX Interfacing

The following data is for a mainframe-interfaced mouse only. Refer to the terminal's section when the mouse is used with a terminal. Transparent software support is provided only for graphics use of this device.

Drivers required	console
Drivers optional	r8042, hil
Block-mode major number	NA
Character-mode major number	0 (console) 23 (r8042), 24 (hil)
DGL handler (terminal)	DL0019, V0019, P0019
DGL handler (via *Starbase*)	L0056, V0056, P0056
Starbase handler	/usr/lib/libddhil.a

46060A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	Not Used	Location	Not Used
Console (hex)	00	0	0	0
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 46060A as third device on Link. For a mouse connected to a terminal, use the terminal's minor number.

```
# mknod /dev/console   c 0  0x000000
# mknod /dev/r8042     c 23 0x000000
# mknod /dev/mouse     c 24 0x000030
```

46060A/Series 300 Pascal Interfacing

Default volume	<none>
Modules required	HPHIL, MOUSE, plus GRAPHICS (any Series 300) or FGRAPHICS (Model 310 with 98635A) or FGRAPH20 (Model 320)

46060A Ordering Information

46060A	HP mouse
46060-90001	HP Mouse Owner's Guide (one included w/46060A)
46080A	2.4m HP-HIL extension (no audio)
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL/RGB extension (with audio)
46082B	30m HP-HIL/RGB extension (with audio)

46080/81A 2.4m HP-HIL Extensions

The 46080A and 46081A are link-powered modules for extending the distance between HP-HIL devices. Each includes a 2.4m HP-HIL cable. The 46081A also has an audio speaker on a separate circuit, with a 3m audio cable. HP-HIL cabling rules for Series 300 computers are described under the 98561-66530 interface.

If the audio circuit is used, the 46081A must be within 2.4m of the host computer or terminal. The audio signal terminates at the 46081A - the 46081A is not an audio extender.

The extensions include an adhesive mounting pad which affixes to the bottom of the extensions via detachable interlocking surfaces. The 46080/81 are user-installable.

46080/81A-Series 300 Support Summary

The 46080/81A are transparent to all software.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46080A	HP-HIL extension	NOP	Yes	Yes	4.0	5.0	3.1
46081A	HP-HIL extension w/audio	NOP	Yes	Yes	4.0	5.0	3.1

46080/81A Specification Summary

Data sheet (for complete specs.)	5953-9584
Dimensions Weight	31mmH, 87mmW, 60mmD 46080A: 0.14 kg 46081A: 0.22 kg
Speaker impedance (46081A only) Speaker jack (46081A only)	8 ohms Subminiature phone, mono

46080/81A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Required	Device Type	Cable Included
46080A	2.4m extension	0	2	25mA	NA	2.4m, flat
46081A	2.4m ext. w/audio	0	2	25mA	NA	2.4m flat, 3m audio

46080/81A/Series 300 Interfacing

The 46080/81A may be used with any Series 300 mainframe HP-HIL interface. The HP-HIL interface of the 98700H display station is supported only by BASIC and then only on the Model 320 with the 98561-66530 human interface card removed. The 46080/81A may be anywhere on the link.

Host Connection	Extension Cable	46080/81A Connection	46080/81A Connection	HP-HIL Cable	HP-HIL Device
HP-HIL ••	46080-61601 (included) 2.4m	HP-HIL •	HP-HIL ••	46020-60001 46080-61601 46083-61601	•

Host Audio Connection	Adaptor	Audio Cable	46081A Connection
Audio output (male RCA phono)	1252-1112	46081-61601 (included)	46082 Audio input (female submin. phone)

The audio cable supplied with the 46081A is not mechanically compatible with the audio outputs of the Series 300 mainframes. The 1252-1112 adaptor is *not* included with the 46081A. It *is* included with the 98544A and 98545A high resolution video boards (and the 98582A and 98583A bundled systems which include those boards).

46080/81A Ordering Information

46080A	2.4m HP-HIL extension
46081A	2.4m HP-HIL extension with audio
1252-1112	Male RCA phono plug -to- female subminiature phone jack adaptor
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46080-61601	2.4m flat HP-HIL cable (one included w/46080/81A)
46080-90000	Installation Note (one included w/46080A)
46081-61601	3.0m audio cable (one included w/46081A)
46081-90001	Installation Note (one included w/46081A)
46082-61601	0.5m audio cable
46083-61601	0.5m flat HP-HIL cable
46082A	15m HP-HIL/RGB extension (with audio)
46082B	30m HP-HIL/RGB extension (with audio)

46082A/B 15/30m HP-HIL/Coax Extensions

The 46082A and 46082B are link-powered modules for extending the distance between HP-HIL devices and between CRT monitors and their video interfaces. Each extension product consists of the following:

2 Repeaters with speaker
1 15 or 30m length of repeater interconnect cable
1 15 or 30m length of 3 (RGB) coax cables terminated with male BNC connectors
1 0.4m flat HP-HIL cable
1 0.5m audio cable terminated with male mono subminiature phone plugs

Although both repeater modules have a speaker, only the speaker at the *remote* end is active.

The 46082 is intended primarily for use with color workstations. You may also use it with the 35721 and 35731 monitors; however, this connection will require a female BNC-to-male phono adaptor. The 46082 cannot be used with the 98781A monochromatic monitor, as that monitor has a 7-pin sync/audio/HP-HIL cable which is incompatible with the 46082.

HP-HIL cabling rules for Series 300 computers are described under the 98561-66530 interface. The 46082A/B's 15 or 30m interconnect is not included in the 21m limit.

The repeaters include an adhesive mounting pad which affixes to the bottom of the extensions via detachable interlocking surfaces. The 46082 is user-installable.

46082/Series 300 Support Summary

The 46082 is transparent to all software.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46082A	15m HP-HIL extension	NOP	Yes	Yes	4.0	5.0	3.1
46082B	30m HP-HIL extension	NOP	Yes	Yes	4.0	5.0	3.1

46082 Specification Summary

Data sheet (for complete specs.)	5953-9584
Dimensions (each repeater)	31mmH, 87mmW, 60mmD
Weight (entire product)	_____ kg (46082A) _____ kg (46082B)
Speaker impedance	8 ohms
Speaker jack	Subminiature phone, mono

46082 HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Required	Device Type	Cable Included
46082A	15m extension	0	2	40mA	NA	0.4m flat, 0.5m audio
46082B	30m ext. w/audio	0	2	40mA	NA	2.4m flat, 0.5m audio

46082/Series 300 Interfacing

The 46082 may be used with any Series 300 mainframe HP-HIL interface. The HP-HIL interface of the 98700H display station is supported only by BASIC and then only on the Model 320 with the 98561-66530 human interface card removed. The 46082 may be anywhere on the link, but one end must be within 0.5m of the host computer if the audio circuit is used.

Host Connection	Extension Cable	46082 Connection	Repeater Cable	46082 Connection	HP-HIL Cable	Next HP-HIL Device
HP-HIL ••	46082-61601 (included) 0.5m	HP-HIL •	15 or 30m	HP-HIL ••	46020-60001 46080-61601 46083-61601	•

Host Audio Connection	Adaptor	Audio Cable	46082 Connection
Audio output (male RCA phono)	1252-1112	46081-61601 (included)	46082 Audio input (female submin. phone)

The audio cable supplied with the 46082 is not mechanically compatible with the audio outputs of the Series 300 mainframes. The 1252-1112 adaptor is *not* included with the 46082. It *is* included with the 98544A and 98545A high resolution video boards (and the 98582A and 98583A bundled systems which include those boards).

46082 Ordering Information

46082A	15m HP-HIL extension with audio
46082B	30m HP-HIL extension with audio
1252-1112	Male RCA phono plug -to- female subminiature phone jack adaptor
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46080-61601	2.4m flat HP-HIL cable
46081-61601	3.0m audio cable
46082-61601	0.5m audio cable (one included w/46082A/B)
46082-90000	HP 46082 Installation Note (one included w/46082A/B)
46083-61601	0.5m flat HP-HIL cable (one included w/46082A/B)

46083A HP-HIL Rotary Control Knob

The 46083A is an HP-HIL module which provides 2-axis relative cursor positioning via a rotary knob and 2-axis toggle button. The 46083A is best suited to text editing and spreadsheet applications. Any "picking" function must be provided by a keyboard device on the link. For combined pointing and picking, select the 46060A mouse, 35723A touchscreen or 46087/88A digitizers. For more than two-coordinate positioning, select the 46085A control dial module.

The 46083A has a non-skid pad on its bottom surface. The 46083 is user-installable.

46083A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46083A	HP-HIL Knob	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
46083A	Used as ITE	Yes	Via *Starbase*	5.0	3.1
46083A	Used with 239x terminal	NA	5.0*	5.0*	NA

46083A Specification Summary

Data sheet (for complete specs.)	5953-9584
Weight	0.2 kg
Interface and command set	HP-HIL, Graphics relative
Counts per revolution	480
Count buffer size	256 counts

46083A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Connectors	DC Power Required	Device Type	Cable Included
46083A	HP-HIL Knob	1	2	75mA typ. 100 mA max.	Graphics Relative	0.5m, flat

46083A/Series 300 Interfacing

All Series 300 operating systems support the 46083A as a text or graphics device. BASIC, Pascal and HP-UX support the 46083A connected to the built-in HP-HIL of the Series 300 computer. HP-UX also supports the 46083A through the 2393A terminal (although this is handled by the terminal and is transparent to the HP-UX system). The HP-HIL interface of the 98700H display station is supported only by BASIC and then only on the Model 320 with the 98561-66530 human interface card removed.

The 46083A may be placed anywhere on the link.

* When used with a terminal, resolution is limited to the terminal's display resolution, typically 512×390.

46083A/Series 300 BASIC Interfacing

Typical device specifier	KBD (or 2)
Binaries required	KBD
Binaries optional	GRAPH, GRAPHX, KNB2_0
Programming required	None
Programming optional	GRAPHICS INPUT IS KBD,"KBD"

46083A/Series 300 HP-UX Interfacing

Transparent software support is provided only for graphics use of this device.

Drivers required	hil
Drivers optional	r8042
Block-mode major number	NA
Character-mode major number	0 (console) 23 (r8042) 24 (hil)
DGL handler (terminal)	L0019, V0019
DGL handler (via *Starbase*)	L0056, V0056
Starbase handler	/usr/lib/libddhil.a

46083A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	Not Used	Location	Not Used
console (hex)	00	0	0	0
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 46083A as second device on Link.

```
# mknod /dev/console   c  0 0x000000
# mknod /dev/r8042     c 23 0x000000
# mknod /dev/knob      c 24 0x000020
```

This is for 46083A on the built-in HP-HIL. For a terminal, use the terminal minor number.

46083A/Series 300 Pascal Interfacing

Default volume	<none>
Modules required	HPHIL, A804XDVR, GRAPHICS (any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

46083A Ordering Information

46083A	HP-HIL Knob
46083-90000	HP-HIL Knob Installation Note (one included w/46083A)
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46080-61601	2.4m flat HP-HIL cable
46080A	2.4m HP-HIL extension (no audio)
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL/RGB extension (with audio)
46082B	30m HP-HIL/RGB extension (with audio)
46083-61601	0.5m flat HP-HIL cable (one included w/46083A)

46084A ID Module

The 46084A ID Module contains a unique machine readable serial number required by software which uses HP's "Codeword Delivery" security scheme (e.g. 98305A HP EGS) or software which is customized to an included 46084A.

You may also use the 46084A as an HP-HIL extension (instead of a 46080A) by replacing the 0.5m cable with a 2.4m cable. The 46084A has no audio input. The 46084A is user-installable.

46084A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46084A	HP-HIL ID Module	NOP	Yes	Yes	4.0	5.0	Special

46084A Specification Summary

Data sheet (for complete specs.)	5953-9587
Dimensions	35mmH, 64mmW, 105mmD
Weight	0.13 kg
ID string returned	refer to following table

Returned ID string

Field	Location	Comments (examples in binary)
Format type	bits 7-4 of byte 1	always 0001 in 46084A
Model number	bytes 2 and 3, plus bit 7 of byte 4, in reverse-byte order	always 0 10110100 00000100 for 46084
Model letter	bits 6-0 of byte 4, in ASCII	1000001 ("A") for new 46084A 0110001 ("1") for exchange 46084
Date-code and serial number	bytes 5, 6, 7 and bits 5-0 of byte 8, in reverse-byte order	see below for range
Country of origin letter	bit 6-0 of byte 9, in ASCII	1000001 ("A") for USA

Example: 46084A ID Module, serial number 2519A00055 returns the following byte string (expressed in hexadecimal): 10 04 B4 41 97 B0 03 0F 41 The date-code & serial number is interpreted as follows (in decimal) "YYWWDDDDD", where: "YY" = Year of manufacture minus 1960 (24 to 39); "WW" = Week of engineering revision (01 to 53); "DDDDD" = Serial digits (00000 to 99999)

Note - the entire 9 byte string is guaranteed to be unique. The "date-code & serial number" substring is not. Encountering a country-of-origin letter other than "A" is likely. Unused bit 7 of byte 9 and bits 6 & 7 of byte 8 are reserved for future use and should be masked when read for display purposes.

46084A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Required	Device Type	Cable Included
46084A	ID Module	1	2	35mA typ. 60mA max.	Report Security	0.5m, flat

46084A/Series 300 Interfacing

The 46084A may be used with any Series 300 mainframe HP-HIL interface. The HP-HIL interface of the The 46084A may be placed anywhere on the link.

Host Connection	Peripheral Cable	Peripheral
98561-66530 or Model 310 built-in HP-HIL interface	Supplied	46084A

46084A/Series 300 BASIC Interfacing

Typical device specifier	None
Binaries required	KBD
Binaries optional	None
Programming required	`SYSTEM$("SERIAL NUMBER")`

If the computer also has an ID PROM, the 46084A ID string is reported. If there is more than one 46084A present, the ID string of the last 46084A is reported. A sample program is included with BASIC 4.0 to convert the raw ID string into a string of the form `"46084A 2519A00055"`.

46084A/Series 300 HP-UX Interfacing

Drivers required	`r8042, hil`
Block-mode major number	NA
Character-mode major number	23 (r8042) 24 (hil)

46084A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	Not Used	Location	Not Used
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 46084A as third device on Link. For an ID Module connected to a terminal, use the terminal's minor number.

```
# mknod /dev/r8042      c 23 0x000000
# mknod /dev/security   c 24 0x000030
```

46084A/Series 300 Pascal Interfacing

Pascal support for the 46084A is presently available only as a special at a time and materials charge. Contact your local HP Systems Engineer (SE) for details.

46084A Ordering Information

46084A	HP-HIL ID Module
46084-90000	HP 46084A ID Module Installation Note (one included w/46084A)
46020-60001	0.8-to-3.0m coiled HP-HIL cable
46080-61601	2.4m flat HP-HIL cable
46083-61601	0.5m flat HP-HIL cable (one included w/46084A)

46085A HP-HIL Control Dials

The 46085A is an HP-HIL module which provides nine graphics positioning devices (implemented as three 3-axis devices). Any "picking" function must be provided by a keyboard or button device on the link. The 46085A is commonly used in graphics display applications to provide 3-axis attitude, 3-axis translation, scaling and other attribute functions. The 46085A is customer installable.

46085A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46085A	HP-HIL Control Dial Box	NOP	Yes	Yes	No	5.0	No

The 46085A is not presently supported by any terminals.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
46085A	Control Dial Box	No	Via *Starbase*	5.0	No

46085A Specification Summary

Data sheet (for complete specs.)	5953-9584
Dimensions	64mmH, 170mmW, 215mmD
Weight	0.9 kg
Interface and command set	HP-HIL, Graphics relative
Counts per revolution (each knob)	480
Buffer size (one buffer per three horiz. knobs)	256 counts

46085A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Connectors	DC Power Required	Device Type	Cable Included
46085A	Control Dial	2	2	320mA max.	Graphics Relative	0.8-3.0m, coiled

46085A/Series 300 Interfacing

HP-UX supports the 46085A connected to the built-in HP-HIL of the Series 300 computer. BASIC and Pascal do not presently support the 46085A.

The 46085A may be placed anywhere on the link.

46085A/Series 300 HP-UX Interfacing

Note that the 46085A consumes three consecutive addresses on the link.

Drivers required	`hil`
Drivers optional	`r8042`
Block-mode major number	NA
Character-mode major number	23 (r8042) 24 (hil)
DGL handler (via *Starbase*)	`L0056, V0056, P0056`
Starbase handler	`/usr/lib/libddhil.a`

46085A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	Not Used	Location	Not Used
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 46085A as second, third and fourth devices on Link.

```
# mknod /dev/console    c  0 0x000000
# mknod /dev/r8042      c 23 0x000000
# mknod /dev/dial.top   c 24 0x000020
# mknod /dev/dial.mid   c 24 0x000030
# mknod /dev/dial.bot   c 24 0x000040
```

46085A Ordering Information

46085A	HP-HIL Control Dial Box
46085-85000	Blank overlay (3 included w/46085A)
46085-90000	Control Dial Installation Note (one included w/46085A)
46020-60001	0.8-to-3.0m coiled HP-HIL cable (one included w/46085A)
46080-61601	2.4m flat HP-HIL cable
46080A	2.4m HP-HIL extension (no audio)
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL/RGB extension (with audio)
46082B	30m HP-HIL/RGB extension (with audio)
46083-61601	0.5m flat HP-HIL cable

46086A HP-HIL Button Box

The 46086A is a special purpose HP-HIL "secondary" keyboard, providing 32 user-definable buttons and one user-programmable LED. It includes one pre-printed and two blank overlays. The 46086A is user-installable.

46086A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46086A	HP-HIL Button Box	NOP	Yes	Yes	No	5.0	No

The 46086A is not presently supported by any terminals.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
46086A	Button Box	No	Via *Starbase*	5.0	No

46086A Specification Summary

Data sheet (for complete specs.)	5953-9584
Dimensions Weight	64mmH, 170mmW, 215mmD 0.8kg
Interface and command set	HP-HIL, Graphics relative

46086A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Connectors	DC Power Required	Device Type	Cable Included
46086A	Button Box	1	2	60mA max.	Special Keyboard	0.8-3.0m, coiled

46086A/Series 300 Interfacing

HP-UX supports the 46086A connected to the built-in HP-HIL of the Series 300 computer. BASIC and Pascal do not presently support the 46086A.

The 46086A may be placed anywhere on the link. As it identifies as a "secondary" keyboard, it does not affect keycode translation tables set up for any 46020-series keyboard also present.

46086A/Series 300 HP-UX Interfacing

Drivers required	`hil`
Drivers optional	`r8042`
Block-mode major number	NA
Character-mode major number	23 (r8042) 24 (hil)
DGL handler (via *Starbase*)	`B0056`
Starbase handler	`/usr/lib/libddhil.a`

46086A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	Not Used	Location	Not Used
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 46086A as second device on link.

```
# mknod /dev/r8042      c 23 0x000000
# mknod /dev/buttons    c 24 0x000020
```

46086A Ordering Information

46086A	HP-HIL Button Box
46020-60001	0.8-to-3.0m coiled HP-HIL cable (one included w/46086A)
46080-61601	2.4m flat HP-HIL cable
46080A	2.4m HP-HIL extension (no audio)
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL/RGB extension (with audio)
46082B	30m HP-HIL/RGB extension (with audio)
46083-61601	0.5m flat HP-HIL cable
46086-85000	Blank overlay (one included w/46086A)
46086-85001	Pre-printed overlay (one included w/46086A)
46086-90000	Button Box Installation Note (one included w/46086A)

46087/88A HP-HIL Digitizers and 46089A Cursor

The 46087A and 46088A are low-cost, high-resolution digitizers suitable for menu/object picking, free-hand graphics entry and digitizing. The 46087A is ANSI A/ISO A4 size. The 46088A is ANSI B/ISO A3. Both digitizers include a stylus with tip switch and a platen overlay.

The 46089A four-button cross-hair cursor is available separately or as digitizer Option 001. The cursor is recommend for digitzing existing drawings, artwork or other hardcopy images. The 46087/88 are user-installable.

46087/88/89A-Series300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
46087A	A-size digitizer	NOP	Yes	Yes	4.0	5.0	3.1
46088A	B-size digitizer	NOP	Yes	Yes	4.0	5.0	3.1
46089A	4-button cursor	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
46087A	Used with ITE	4.0	Via *Starbase*	5.0	3.1
46088A	Used with ITE	4.0	Via *Starbase*	5.0	3.1
46089A	Used with ITE	4.0	Via *Starbase*	5.0	3.1
46087A	Used with 239x terminal	NA	5.0*	5.0*	NA
46088A	Used with 239x terminal	NA	5.0*	5.0*	NA
46089A	Used with 239x terminal	NA	5.0*	5.0*	NA

46087/88/89A Specification Summary

Data sheet (for complete specs.)	5953-9584
Dimensions	64mmH, 385mmW, 310mmD
Weight	3.0 kg
Interface and command set	HP-HIL
Active area	297.6mmH, 216.5mmV (46087A) 432.4mmH, 297.6mmV (46088A)
Resolution	40 lines/mm
Static accuracy	±0.5mm over active area
Repeatability	±0.25mm over active area
Data rate	65 coord. pairs/sec. max.
Dynamic accuracy	±1mm at 75cm/sec
Overlay and digitized material	any non-magnetic

* When used with a terminal, resolution is limited to the terminal's display resolution (typically 512×390).

46087/88/89A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Required	Device Type	Cable Included
46087A	A-size digitizer	1	2	200mA max.	Graphics Absolute	0.8-3.0m, coiled
46088A	B-size digitizer	1	2	200mA max.	Graphics Absolute	0.8-3.0m, coiled
46089A	4-button cursor	no change	no change	no change	no change	___mm

46087/88/89A-Series300 Interfacing

The 46087/88A may be used with any Series 300 mainframe HP-HIL interface. The HP-HIL interface of the 98700H display station is supported only by BASIC and then only on the Model 320 with the 98561-66530 human interface card removed. The 46087/88A may be anywhere on the link.

Host Connection	Peripheral Cable	Peripheral
98561-66530 or Model 310 built-in HP-HIL interface	Supplied	46087/88A

46087/88/89A-Series 300 BASIC Interfacing

Typical device specifier	`KBD` (or 2)
Binaries required	GRAPH, GRAPHX, KBD
Binaries optional	None
Programming required	`GRAPHICS INPUT IS KBD,"TABLET"`

46087/88/89A-Series 300 HP-UX Interfacing

The following data is for a mainframe-interfaced digitizer only. Refer to the terminal's section when the digitizer is used with a terminal.

Drivers required	`r8042, hil`
Block-mode major number	NA
Character-mode major number	23 (r8042) 24 (hil)
DGL handler (terminal)	`L0019, V0019, P0019`
DGL handler (via *Starbase*)	`L0056, V0056, P0056`
Starbase handler	`/usr/lib/libddhil.a`

46087/88/89A-Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	Not Used	Location	Not Used
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 46087/88A as third device on link.

```
# mknod /dev/r8042        c 23 0x000000
# mknod /dev/digitizer    c 24 0x000030
```

46087/88/89A-Series 300 Pascal Interfacing

Default volume	<none>
Modules required	HPHIL, DGL_ABS plus GRAPHICS (any Series 300) or FGRAPHICS (Model 310 with 98635A) or FGRAPH20 (Model 320)

46087/88/89A Ordering Information

46087A	A-size digitizer
Option 001	adds 46089A cursor
46088A	B-size digitizer
Option 001	adds 46089A cursor
46089A	4-button cursor
5061-6537	Stylus holder (one included w/46087/88A)
5061-6536	Stylus (one included w/46087/88A)
46020-60001	0.8-to-3.0m coiled HP-HIL cable (one included w/46087/88A)
46080A	2.4m HP-HIL extension (no audio)
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL extension (with audio)
46082B	30m HP-HIL extension (with audio)
46080-61601	2.4m flat HP-HIL cable
46083-61601	0.5m flat HP-HIL cable
46087-88801	Blank overlay (one included w/46087A)
46087-90001	46087A Installation Note (one included w/46087A)
46088-88801	Blank overlay (one included w/46087A)
46088-90001	46088A Installation Note (one included w/46088A)

5061-6538 Series 300 Boot ROM

5061-6538, -6539, -6540 and -6541 are the part numbers for the Series 300 revision A boot ROM. These numbers are provided here for reference only, as these ROMs are not intended to be purchased separately. The part numbers are likely to change to an 1818- prefix and different suffixes after a scheduled production change over to ROM (from the present EPROM form). The revision A boot ROM set is always pre-installed in your Series 300 computer. The ROM set is socketed in anticipation of future enhancements.

This section describes feature/peripheral support and summarizes boot ROM keyboard commands.

Although the rev. A ROM code was derived from the Series 200 4.0 boot ROM, the rev. A ROM is not intended for use in Series 200 computers. A summary of changes and features known-to-not-work appears later in this section.

Rev. A Boot ROM/Series 300 Support Summary

Product	Description	Hardware Support		Earliest Operating System Version		
		310	320	BASIC	HP-UX	Pascal
5061-6538...41	Rev. A Boot ROM	Yes	Yes	4.0	5.0	3.1
	Re-enter ROM from system	-	-	4.0	5.0	3.1

Revision A Boot ROM Specifications

The boot ROM can load a ROM system or a file from a LIF or SRM "SYSTEM" type file having a name of the form `SYS`α..., `SYST`α..., `SYSTE`α..., `SYSTEM`α... or `"SYSTEM_`α..."`, where "`α`" is typically an ASCII letter but may be any character legal in a file name.

ROM systems are assigned a single letter ID (only `"B"`, for BASIC, is presently supported on Series 300).

All system files found are assigned an ID of the form "$\eta\eta\epsilon$". "ϵ" is either the same letter "α" mentioned above (if an ASCII letter), or `"Z"` (if not an ASCII letter). "$\eta\eta$" is a number from `" 1"` to `"99"` denoting the order of occurence of systems which result in the same ID letter "ϵ". The range of system IDs is `" 1A"` to `"99Z"`.

The boot ROM loads the first system found unless characters (other than that system's ID) are typed on the boot control keyboard (see below). The search order used by the boot ROM is:

- For select codes 7 thru 31: disc or tape at bus address 0, unit 0, volume 0
- SRM at select code 21, node 0, volume 8, "/SYSTEMS" directory
- 98259A Bubble system at select code 30
- 98255 EPROM "disc"-type system at unit 0 (lowest address of all 98255s installed)
- ROM systems (from lowest to highest ROM address)
- For select codes 0 thru 31, bus addresses 0 to 7, units 0 to 16, volumes 0 to 7: all remaining discs or tapes.
- For select codes 0 thru 31, nodes 1 thru 63, volumes 1 to 50: any other SRM system files in "/SYSTEMS" directories
- For select codes 0 thru 29, and 31: remaining 98255 Bubble systems
- Remaining 98255 "disc"-type EPROM units.

It is not necessary to have a display or keyboard present for the boot ROM to sucessfully load a system. Some operating systems require that a keyboard interface be present (Model 310 built-in, 98561-66530 or 98700H external).

Boot ROM Commands

Command	Function
1A to 99Z	Boot system with that ID
RESET	Re-start boot process
ENTER	Pause or resume boot process
CTRL-C	Enter test/configuration menu: T - Perform extended self test L - Loop: iterate test until fatal error or "L" typed 5 - Set 98546A interface to 50 Hz refresh 6 - Set 98546A interface to 60 Hz refresh

The following two tables summarize the support of plug-in cards/boards and external peripherals. Boot ROM support information is also provided in the discussion of each device in this appendix.

Legend for following boxed tables:

Transparent	Function depends on cards installed
Console	Message display and boot control keyboard
Keyboard	Boot control keyboard
CPU	Executes the boot ROM code
Display	Boot message display device
ID	Boot identifies the card or board on the display
Load	A system may be loaded via this interface/device
NOP	No operation - device is otherwise ignored
RAM	Loaded into from "load" device
Test	The boot ROM tests the device, or executes the device's self-test. Note that the test may be limited to performing a checksum.
Total	Installed RAM shown as "total installed" only

System Board, Interface and Accessory Boot ROM Support

Board or Card	ID	Test	Use	Comments
50961A#200 SRM/Coax interface	Yes	No	Load	BASIC, Pascal only
98253A EPROM programmer	Yes	No	NOP	
98254A 64 Kbyte RAM	Total	Yes	RAM	Unsupported
98255A EPROM card	Yes	Yes	Load	Only if EPROM "disc" format
98256A 256 Kbyte RAM	Total	Yes	RAM	
98257A 1.0 Mbyte RAM	Total	Yes	RAM	
98259A Bubble card	Yes	No	Load	
98287A 98700H video	Yes	No	Display	If at 0x560000 (internal) and
98287A 98700H HP-HIL	No	No	Keyboard	If sole keyboard interface
98542A 512x400x1 video	Yes	No	Display	
98543A 512x400x4 video	Yes	No	Display	
98544A 1024x768x1 video	Yes	No	Display	
98545A 1024x768x4 video	Yes	No	Display	
98546A Compatibility video	Yes	Yes	Display	
98561-66511 Model 310 CPU (-512K)	-	-	-	Refer to 98561-66512
98561-66512 Model 310 processor	Yes	Yes	CPU	
Built-in 1.0 Mbytes RAM	Total	Yes	RAM	
Built-in HP-IB interface	Yes	Yes	Load	With supported disc/tape
Built-in HP-HIL interface	Yes	Yes	Keyboard	With 46020-series keyboard
Built-in RS-232C interface	Yes	Yes	Console*	With supported terminal*
Built-in video interface	Yes	Yes	Display	With supported monitor
98561-66511 Model 310 CPU (-video)	-	-	-	Refer to 98561-66512
98561-66519 Model 320 processor	Yes	Yes	CPU	
98561-66530 Human interface	Yes	Yes		
Built-in HP-IB interface	Yes	Yes	Load	With supported disc/tape
Built-in HP-HIL interface	Yes	Yes	Keyboard	With 46020-series keyboard
Built-in RS-232C interface	Yes	Yes	Console*	With supported terminal
98568A Expander	No	No	Transparent	No restrictions
98603A ROM BASIC 4.0	Yes	Yes	Load	
98620A DMA	Yes	Yes	Load	BASIC and Pascal only
98620B DMA	Yes	Yes	Load	
98622A GPIO interface	Yes	No	Unsup.	Refer to 9885 section
98623A BCD interface	Yes	No	NOP	
98624A HP-IB interface	Yes	Yes	Load	With supported disc/tape
98625A Disc HP-IB interface	Yes	No	Load	With supported disc/tape
98626A RS-232C interface	Yes	Yes	Console*	With supported terminal
98627A RGB video interface	Yes	Yes	Display	With supported monitor
98628A Datacomm interface	Yes	Yes	NOP	
98629A SRM/Mux interface	Yes	Yes	Load	BASIC, Pascal only
98630A Breadboard interface	Yes	No	NOP	
98633A Multiprogrammer interface	Yes	No	NOP	
98635A Floating point math card	Yes	No	NOP	
98640A Analog input card	Yes	No	NOP	
98641A RJE interface	Yes	No	NOP	
98642A RS-232C Mux interface	Yes	Yes	Console*	Port 1 only
98643A LAN/300 interface	Yes	No	NOP	
98644A RS-232C interface	Yes	Yes	Console*	With supported terminal
98691A PDI interface	Yes	No	NOP	
9888A Bus expander	No	No	Transparent	Some cards restricted

* The "remote" switch or jumper must also be set for use of a terminal as system console.

Peripheral Boot ROM Support Summary

Peripheral	How Used	Comments
AMIGO (7906/20/25M) AMIGO discs	Load	Unsupported
AMIGO (912x/913x) AMIGO discs	Load	
AMIGO (9895A) disc	Load	
CS/80 discs/tape (all)	Load	
SS/80 discs (all)	Load	
13279B monitor	Display	With 98627A interface
238x/9x terminals	Console	With appropriate interface
262x terminals	Console	Not all supported
264x terminals	Console	Not supported
3572x/3x/4x monitors	Display	With appropriate interface
46020-series keyboards	Keyboard	
797x mag tapes	-	Ignored by boot ROM
98204A/B	Display	Not supported
98700H display station	Console	With 98287A interface (see 98287A in previous table)
98781/82 monitors	Display	With supported interface

The following Series 200 features of the rev. A ROM are known to not work:

- Identification of ID PROM (Series 300 has none)
- Use with all 8 MHz and early 12.5 Mhz processors (ROM pin-out changed).
- Recognition of CPU ID switches (Series 300 has none).

The following features (untested) will probably be removed in future versions of Series 300 boot ROMs:

- Support for any Series-200-only features; such as 9130K/31G discs.
- 9885 as load device.

Revision A Boot ROM/Series 300 BASIC Interfacing
The minimum BASIC system (no binaries) contains support for the `SYSBOOT` command, which re-enters the boot ROM. No means is provided for specifying the system to boot prior to entering the boot ROM.

Revision A Boot ROM/Series 300 HP-UX Interfacing
The HP-UX AXE includes the command `"/bin/reboot"` which gracefully stops the system and provides the capability to simply halt, re-enter the boot ROM under operator control, or directly boot a system named in the command. This capability is also available as the *reboot(2)* system call.

Revision A Boot ROM/Series 300 Pascal Interfacing
Operator reboot is provided in one of two forms:

- If the debugger is not linked into the system, the RESET key enters the boot ROM immediately.
- If the debugger is linked with the system, the RESET key enters the debugger, whereupon you must further type an `"sb"` command to enter the boot ROM.

An application program can also directly enter the boot ROM at entry points *"REQ_REBOOT"* and *"REQ_BOOT"*. No other programmatic use of the boot ROM, or its interface/device drivers, is supported.

50951/52A Network Services/9000

NS/9000 is the HP-UX software required for support of Local Area Network (LAN) services via the 98643A LAN/300 interface (ordered separately). The 50951/52A products consists of system software (including the 98643A driver) and commands. The 50951A product is for single-user systems only. The 50962A product is for single or multi-user systems.

50951/52A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
50951A	Single-user NS/9000	NOP	Yes	Yes	No	5.0	No
50952A	Mutli-user NS/9000	NOP	Yes	Yes	No	5.0	No

50951/52A Specification Summary

Data sheet (for complete specifications)	5953-9564
RAM required (additional)	256 Kbytes
Disc space used (as supplied)	500 Kbytes
Interface required	98643A
Number of interfaces supported	1
Network services (HP AdvanceNet)	RFA, NFT
Network services (non-HP)	Link-level access (LLA)
Driver included (major number)	`ieee802` (18) `ethernet` (19)
Link performance	See 98643A

50951/52A-Series 300 HP-UX Interfacing

NS/9000 is copied from the distribution media to the your system with the HP-UX *update* command. The desired driver is installed with the HP-UX *config* command. A separately specified 98643A LAN/300 link interface is required. Refer to the 98643A section for configuration details.

50951/52A Ordering Information

50951A	Single-user NS/9000 Software for Series 300 HP-UX
Option 022	Software provided on ¼-in. 88140-format tape cartridge
Option 045	Software provided on doubel-sided format 3½-in. flexible disc
50952A	Multi-user NS/9000 Software for Series 300 HP-UX
Option 022	Software provided on ¼-in. 88140-format tape cartridge
Option 045	Software provided on doubel-sided format 3½-in. flexible disc
50951-90000	NS/9000 LAN User's Guide (one included w/50951/52A)
50951-90010	NS/9000 LAN Node Manager's Guide (one included w/50951/52A)
50951A+S00	SMS for 50951A
50951A+W00	Extended SMS for additional copy of 50951A
50952A+S00	SMS for 50952A
50952A+W00	Extended SMS for additional copy of 50952A
35032B	SE Consulting (one day suggested for first node on a new LAN)
98643A	Refer to 98643A for LAN hardware information
99087F+C00	Category support service for Datacomm-C (required if HP-UX software on AMS or RCS support)
99087F+Q00	MUS for all Datacomm-C products
99087F+W00	Extended category support service for Datacomm-C

50961A SRM/Coax Interface and 50961U Upgrade

The 50961A Option 200 interface is used by the Series 200 and 300 BASIC, Pascal and 98693A Series 200/300 HP-UX SRM software to access shared files and peripherals on a 50960A/S, 9920A Option 500 or 9826A Option 500 Shared Resource Management server/controller. The 50961A is user-installable.

The software configuration and programming information in this section also applies to the 98629A interface.

50961U Option 200 upgrades existing 98629A SRM/Mux interfaces to coax capability. The 50961U requires ROM installation by an HP Customer Engineer.

This section documents the use of the 50961A SRM interface with the SRM coax adaptor. This configuration is recommended for all new SRM systems and most system expansions. It offers longer, smaller cables and reduced cost. This section does not describe SRM cabling using 98028A SRM Multiplexers - see the 98269A section of this appendix.

This section does not document the configuration of this interface in the SRM server/controller. For that data, refer to 5953-9550 **Shared Resource Management System Planning Guide** and 09800-90020 **HP 9000 Series 200 Configuration Information and Order Guide.**

The 50961A Option 200 consists of a modified 98629A SRM interface, SRM coax adaptor and BNC tee connector. The 50961A Option 200 interface is useable both by the SRM controller and Series 200/300 SRM workstations. It includes no cables. The Coax Adaptor is powered by the 98629A interface. 50961A-equiped controllers and workstations connect to each other via separately BNC-terminated 92227-series RG-58C/U cables.

50961A/Series 300 Support Summary

The Series 300 Rev. A boot ROM can load any SYSTEM ("SYS...") file from an SRM "/SYSTEM" directory. The HP-UX system cannot execute from an SRM disc.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
50961A	SRM/Coax interface	Rev. A	Yes	Yes	4.0	5.0*	3.1

50961A Specification Summary

Data sheet (for complete specifications)	5953-9516
Coax cable type	RG-58C/U
Maximum coax cable length	1000m
SRM cards per system	Select code limited
SRM coax cards per link	25 max.
Interrupt levels	3...6
Basic link rate	750K bps

* Requires 98693A SRM Access software.

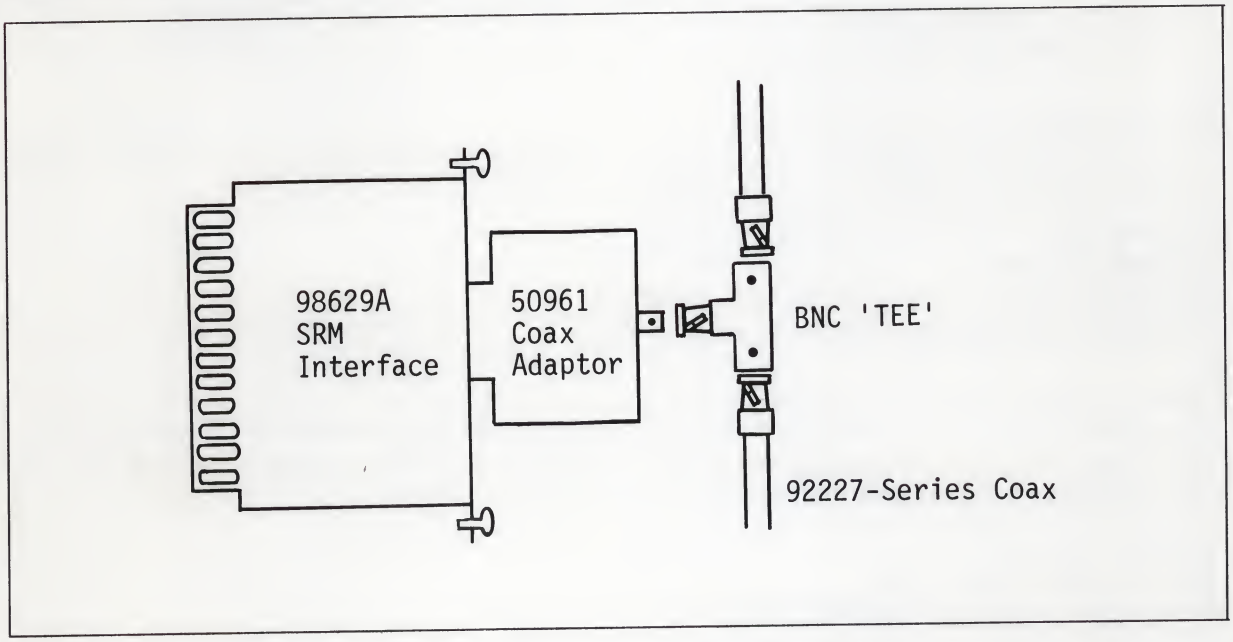
50961A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
50961A#200	HP SRM/Coax interface	1	Yes	21: 8 to 31	Yes	No

The factory default select code of 21 is the same as the 98643A LAN/300 interface card. If both types of card are present (HP-UX only), change the select code of the 98643A card.

50961A/Series 300 Interfacing

Each 50961A Option 200 interface in the server/controller supports a single low-cost coax link of up to 1000m. Connection to the server/controller and each workstation is via BNC 'tee' connectors. A single coax link connects up to 25 *nodes* (SRM controllers, workstations or SRM-equipped HP-UX systems). The SRM server/controller may have as many 50961A Option 200 and 98629A interfaces as needed to support the maximum of 64 workstations. An HP 9888A Bus Expander may be required, depending on the controller/server used.



50961A#200 Switches	Sample Configuration	Comments
Select Code	21	Factory default (caution if 98643A present)
Node	10	10...63 for workstations (each must be unique) 00...09 for servers/controllers (each must be unique)
Interrupt level	4	Required

Note

The 50961A SRM/Coax interface and the 98643A LAN/300 Link employ the same coaxial cable components (92227-series). SRM and LAN cannot co-exist on the same cable. Separate SRM and LAN cabling is required if both networks are used. These two cards also have the same default select code.

Materials Supplied

Description	50961A Option 200	Order Separately
Series 300 BASIC 4.0 SRM Access software	-	Standard w/BASIC
Series 300 HP-UX SRM Access software	-	98693A Option 022, 045
Series 300 Pascal 3.1 SRM Access software	-	Standard w/Pascal
98629A interface card	Included	NA
SRM Coax Adaptor	Included	NA
BNC tee connector w/cover	Included	92227N
Insulating BNC cover	Included	92227R
BNC cable, connectored, PVC, 1/2/4/8m	-	92227A/B/C/D
BNC cable, connectored, PVC, 16/32/64/128m	-	92227E/F/G/H
BNC terminators (pair)	-	92227P
BNC cable, unterminated PVC	-	92227J
BNC cable, unterminated FEP	-	92227K
BNC connectors, one pair	-	92227L
Facility BNC tool kit	-	92227M

50961A/Series 300 BASIC Interfacing

BASIC provides full Remote File Access (RFA) to SRM files (which implies NFT). BASIC accesses shared printers and plotters by printing and plotting to SRM spool files.

Typical msus	`:REMOTE 21,0`
Binaries required	DCOMM, SRM
Binaries optional	MS, TRANS, GRAPH
Programming required	None

50961A/Series 300 HP-UX Interfacing

The 98693A SRM Access commands provides only Network File Transfer (NFT) between HP-UX and SRM. HP-UX can access shared printers and plotters by first printing or plotting to a local HP-UX file and then transferring that file (with *srmcp*) to the SRM.

Drivers required	`srm`
Block-mode major number	NA
Character-mode major number	13

50961A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	Not Used	Node
Values (hex)	08 to 1F	0	00 to FF

Typical *mknod* for 50961A at select code 21 and node address 10.

```
# mknod /dev/srm   13 c 0x15000b
```

50961A/Series 300 Pascal Interfacing

Pascal provides full Remote File Access (RFA) to SRM files (which implies NFT). Pascal accesses shared printers and plotters by printing and plotting to SRM spool files.

Default volume	5
Modules required	DATA_COMM, SRM
Programming required	None

50961A Ordering Information

50961A	SRM/Coax adaptor
Option 200	adds interface for Series 200/300 use
50961U	SRM/Coax adaptor
Option 200	adds upgrade ROM for 98629A interface
7120-1957	Select code labels (one set included w/50961A#200)
92227A	1m PVC coax cable, BNC connectored
92227B	2m PVC coax cable, BNC connectored
92227C	4m PVC coax cable, BNC connectored
92227D	8m PVC coax cable, BNC connectored
92227E	16m PVC coax cable, BNC connectored
92227F	32m PVC coax cable, BNC connectored
92227G	64m PVC coax cable, BNC connectored
92227H	128m PVC coax cable, BNC connectored
92227J	PVC coax cable, unterminated (specify length)
92227K	FEP coax cable, unterminated (specify length)
92227L	BNC connectors, male, one pair
92227M	BNC tool kit (one per facility recommended)
92227N	BNC tee connector with cover
92227P	BNC terminators, with covers, one pair (one set required per link)
92227R	BNC insulating cover (one included w/50961A)
98693A	HP-UX SRM Access software (see 98693A in this appendix)

6940B Multiprogrammer

The 6940B is a general purpose I/O card cage. It is interfaced to Series 200 and 300 computers via GPIO or HP-IB. A wide variety of analog, digital and special purpose plug-in cards are available for the 6940B. For new applications, the 6942A or 6944A Multiprogrammers provide more functionality and better price/performance.

6940B/Series 300 Support Summary

Although designed for HP controllers, the 6940B has never been formally qualified as a computer peripheral on Series 300 and no testing is planned.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
6940B	Multiprogrammer	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
59500A	HP-IB interface	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

59500A (6940B) HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
59500A	6940B HP-IB interface	1	0...30	1	Normal	0.0m	None

6940B/Series 300 Interfacing

The 98622A Option 003 GPIO interface includes a 6940B-compatible cable. The Series 300 built-in or 98624A HP-IB interfaces may be compatible with the 59500A Multiprogrammer Interface Kit (which converts HP-IB to 6940B GPIO).

Refer to 98622A and 98624A for more information (e.g. HP-UX minor number)

6940B/Series 300 BASIC Interfacing

Typical device specifier	12 (GPIO)
Binaries required	GPIO or HPIB
Binaries optional	IO (for interrupt processing), TRANS
Programming required	Extensive

6940B/Series 300 HP-UX Interfacing

Drivers required	`gpio` or `hpib`
Libraries required	`dil`
Block-mode major number	NA
Character-mode major number	22 or 21
Programming required	Extensive

6940B/Series 300 Pascal Interfacing

Default volume	<none>
Modules required	GPIO or HPIB
Programming required	Extensive

6942A Multiprogrammer-II

The 6942A is a general purpose I/O card cage. It is interfaced to Series 200 and 300 computers via HP-IB. A wide variety of analog, digital and special purpose plug-in cards are available for the 6942A. For new applications, the 6944A Multiprogrammer provides higher performance. 6942A specifications are not repeated here. Consult the data sheet *(HP Pub. No. 5953-4089).*

6942A/Series 300 Support Summary

The status of testing the 6942A with Series 300 computers was not known at publication time.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
6942A	Multiprogrammer-II	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

6942A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
6942A	Multiprogrammer-II	1	0...30	1	Normal	0.0m	None

6942A/Series 300 Interfacing

The 14752A software library requires a dedicated 98624A interface. If only user-supplied programming is used, the built-in HP-IB interface may suffice. Refer to 14752A and 98624A for more information.

6942A/Series 300 BASIC Interfacing

Typical device specifier	823 (for 6942A at bus address 23)
Binaries required	HPIB, IO
Binaries optional	TRANS
Programming required	Extensive (without 14752A)

6942A/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Libraries required	`dil`
Block-mode major number	NA
Character-mode major number	21, 22
Programming required	Extensive

6942A/Series 300 Pascal Interfacing

Default volume	<none>
Modules required	HPIB
Programming required	Extensive

6944A Series 200 Multiprogrammer

The 6944A is a Series 200 version of the 6942A. It is interfaced via a dedicated 98633A interface. 6944A specifications are not repeated here.

6944A/Series 300 Support Summary

The status of testing the 6944A with Series 300 computers was not known at publication time.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
6944A	Series 200 Multiprogrammer	Rev. A	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

The revision A boot ROM merely identifies the 98633A interface. The 14752A library is required for support of the 6944A.

6944A/Series 300 Interfacing

Refer to 98633A for detailed information.

7090A Measurement Plotting System

The 7090A is a combined waveform recorder, X-Y recorder and digital plotter. As a digital plotter, the 7090A is functionally identical to the 7475A.

7090A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7090A	Measurement plotting sys.	NOP	Inves.	Inves.	Inves.	Unsup.	Unsup.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7090A	Measurement plotting sys.	Inves.	Unsup.	Unsup.	Unsup.

7090A Specification Summary

Data sheet (for complete specifications)	5953-9728, 5953-9737
Dimensions	206mmH, 575mmW, 465mmD
Weight	15.7 kg (23.6 shipping)
Interface and command set	HP-IB: HP-GL and 7090A
Plotter characteristics	Same as 7475A Option 002
Analog input channels	3, floating, guarded
Sensitivity	5 mV to 100 V full scale
Zero offset	±2 full scale or ±100 V max.
Input impedance	1 Mohm, shunted by 45 pf.
CMRR	140 dB dc, 100 dB ac
Analog-to-digital conversion rate	33 000 samples/sec.
Bandwidth	0 to 3 kHz (-3 dB)
Memory per channel	1000 12-bit words
Timebase	30 mSec to 24 hrs ±1%
AC voltage required	100, 120, 220, 240 +5-10%
AC frequency tolerance	48 to 66 Hz
AC power required	140 Watts

7090A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7090A	Meas. plotting sys.	1	0...30	1	N or H	0.0m	None

7090A/Series 300 Interfacing

Only the built-in HP-IB or 98624A support instruments and/or plotters such as the 7090A.

7090A Switches	Sample Configuration
HP-IB address	5
SRQ	Off
Listen Only	Off

7090A/Series 300 BASIC Interfacing

The 17090B (BASIC 3.0) library and utilities for the 7090A had not been tested in BASIC 4.0 at time of publication.

Typical device specifier	705
Binaries required	HPIB, GRAPH, GRAPHX
Binaries optional	IO, CLOCK
Programming required	`PLOTTER IS 705,"HPGL"`

7090A/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Libraries required	`dil`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`D0046, L0046`
Starbase handler	`/usr/lib/libddhpgl.a`

7090A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-0**
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 7090A at select code 7, bus address 5

```
# mknod /dev/plt     c 7 0x070500
# mknod /dev/hp7090 c 7 0x070501
```

7090A/Series 300 HP-UX Considerations:

- When not operated in "spooling" mode, the DGL and *Starbase* handlers output an HP-GL "OI" instruction to identify the plotter. These handlers are programmed to accept a response of "7090A" as identical to "7475A". This assumtion has not been extensively tested.
- The 7090A has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7090A. If you have a built-in and a 98624A interface, use the 98624A for the 7090A. If possible, a dedicated 98624A is suggested.

7090A/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7090A Ordering Information

7090A	Measurement Plotting System
Option 910	Additional documentation set
17090A	Measurement Graphics Software (not yet tested on Series 300)
Option 630	Software supplied on 3½-in. single-sided flexible discs
Option 655	Software supplied on 5¼-in. double-sided flexible discs
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable
9280-0650	A-size 24-hr. recorder paper
9280-0651	B-size 24-hr. recorder paper
9280-0652	A4-size 24-hr. recorder paper
9280-0653	A3-size 24-hr. recorder paper
Note	Refer to 7475A for plotting supplies

7225A/B Plotter

The 7225 is an ANSI A/ISO A4 size 1-pen graphics plotter. It is no longer supplied, having been replaced by the 7470A.

7225/Series 300 Support Summary

The 7225 has not been tested on any Series 300 computer and is not planned for support.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7225A 17601A	Plotter, with... HP-IB personality module	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
7225A 17601A	Plotter, with... HP-IB personality module	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7225A 17601A	Plotter, with... HP-IB personality module	Unsup.	Unsup.	Unsup.	Unsup.
7225B 17601A	Plotter, with... HP-IB personality module	Unsup.	Unsup.	Unsup.	Unsup.

17601A (7225) HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
17601A	HP-IB module	1	0...30	1	Normal	0.0m	None

7225/Series 300 Interfacing

It is unlikely that the 7225 can be made to function in any Series 300 configuration unless it has the 17601A HP-IB personality module. Only the built-in HP-IB or 98624A presently support HP-IB plotters.

17601A Switches	Sample Configuration
HP-IB address	5
Listen Only	Off

7225/Series 300 BASIC Interfacing

BASIC 1.0 supported the 7225 on the 9826A. Although no changes have been made in subsequent revisions which prohibit the use of the 7225, it has not been tested since 1.0.

Typical device specifier	`705`
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705, "HPGL"`

7225/Series 300 HP-UX Interfacing

No versions of Series 200, 300 or 500 HP-UX DGL or *Starbase* have ever supported the 7225. The 7225's HP-GL command set is similar to the 9872. It may be possible to perform limited plotting using the 9872B handler, and setting the "spooling bit" to prevent the handler from identifying (and rejecting) the 7225. Refer to 9872B for further configuration and consideration information.

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	See 9872B
Starbase handler	See 9872B

7225/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7245A/B Plotter/Printer

The 7245 is an 8½-in.-wide roll-feed thermal plotter/printer. It prints at up to 57 cps and plots (bidirectionally) on any 7.4-in. × 16.4-ft. section of the paper. It is no longer supplied.

7245/Series 300 Support Summary

The 7245 has not been tested on any Series 300 computer and is not planned for support.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7245A/B	Thermal plotter/printer	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

A 7245A may need to have Option 001 (extended HP-GL commands) to function with any Series 300 graphics software.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7245A/B	Thermal plotter/printer	Unsup.	Unsup.	Unsup.	Unsup.

7245 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7245A/B	Plotter/printer	1	0...30	1	N or H	0.0m	None

7245/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple HP-IB printers and plotters. The 7245A/B uses two HP-IB addresses. The address set by the switches (L) is for the plotter. The 7245 automatically uses the next address (L+1) for printing.

7245A/B Switches	Sample Configuration
HP-IB address	5 (plotter) 6 (printer, defaulted)
Listen Only	Off
Error	Off
LPI	6
Alternate char. set	8-bit
ENG/Metric	Your choice
Mode	9872

7245/Series 300 BASIC Interfacing

BASIC 1.0 supported the 7245B on the 9826A. Although no changes have been made in subsequent revisions which prohibit the use of the 7245, the 7245 has not been tested in later versions of BASIC.

Typical device specifier	`705 and 706`
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"` `PRINTER IS 706`

7245/Series 300 HP-UX Interfacing

No versions of Series 200, 300 or 500 HP-UX DGL or *Starbase* have ever supported the 7245. The 7245's HP-GL command set is similar to the 9872. It may be possible to perform limited plotting using the 9872B handler, and setting the "spooling bit" to prevent the handler from identifying (and rejecting) the 7245. Refer to 9872B for further configuration and consideration information.

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	See 9872B
Starbase handler	See 9872B

7245/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7310A Graphics Printer

The 7310A is a 500 lpm thermal line printer with functionality similar to the 2673A and speed similar to the 9876A. The 7310A is no longer supplied. The standard (no Option) 7310A has an HP-IB interface. This discussion does not consider the RS-232C, RS-423A and 8-bit duplex versions.

7310/Series 300 Support Summary

The 7310A has never been supported by any HP 9000 computer and is not planned for support.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7310A	500 lpm printer	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

Product	Description	Hardware Support		Graphics Software Support			
		310	320	BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7310A	500 lpm printer	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

7310A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7310A	500 lpm printer	1	0...30	1	N or H	0.0m	None

7310/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 7310A.

7310A Switches	Sample Configuration
HP-IB Address	1
Line feed on...	CR-LF
SRQ	Off
Listen only	Off
Auto page	per operating system
Eject	On
US/A4	Your choice
Display functions	Off
Alternate char. set	8-bit
Enq/Ack	Off
ENH reset	Off
Pitch	Fixed

7310/Series 300 BASIC Interfacing

7310A AUTO PAGE	On
Typical device specifier	`701`
Binaries required	HPIB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS	May work, not supported

7310/Series 300 HP-UX Interfacing

7310A AUTO PAGE	Off
Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	modify `2631g`
DGL/*Starbase* handler	None

7310/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Not Used	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	0	1="NOCR"	1=RAW

Typical *mknod*s for 7310 at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

7310/Series 300 HP-UX Considerations:

- The 7310A has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7310A. If you have a built-in and a 98624A interface, use the 98624A for the 7310A. If possible, a dedicated 98624A is suggested.
- The 7310G may be able to print graphics raster data supplied by the *dump_graphics.c* command.

7310/Series 300 Pascal Interfacing

7310A AUTO PAGE	On
Default volume	PRINTER: or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump	may work, not supported

7470A Plotter

The 7470A is an ANSI/ISO A/A4-size 2-pen plotter. It is the most economical HP plotter.

7470A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7470A Option 002	A/A4-size plotter HP-IB interface	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7470A Option 002	A/A4-size plotter HP-IB interface	4.0	5.0	5.0	3.1

7470A Specification Summary

Data sheet (for complete specifications)	5953-9755
Dimensions	127mmH, 432mmW, 343mmD
Weight	6 kg (10 kg shipping)
Interface and command set	HP-IB, HP-GL
Paper sizes	ANSI A, ISO A4
Pen speed	1 to 38cm/sec, 2g accel.
Resolution	0.025mm
Repeatability	0.1mm (0.2mm pen-to-pen)
Character set	ASCII, some ISO 7
AC voltage required	100, 120, 220, 240 +5-10%
AC frequency tolerance	48 to 66 Hz
AC power required	25 W max.

7470A HP-IB Characteristics

SH1, AH1, T2, TE0, LE0, SR1, RL0, DC1, DT0, L2, PP0 (PP2 at addresses 0...7 or listen-only).

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7470A	A/A4-size plotter	1	0...30	1	N or H	0.0m	None

7470A/Series 300 Interfacing

Only the built-in HP-IB or 98624A support plotters such as the 7470A.

7470A Switches	Sample Configuration
HP-IB address	5
US/A4	Your choice

7470A/Series 300 BASIC Interfacing

Typical device specifier	705
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"`

7470A/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`D0031, L0031`
Starbase handler	`/usr/lib/libddhpgl.a`

7470A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 7470A at select code 7, bus address 5

```
# mknod /dev/plt  b 7 0x070500
```

7470A/Series 300 HP-UX Considerations:

- The 7470A has no pacing protocol. When it is busy (plotting), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7470A. If you have a built-in and a 98624A interface, use the 98624A for the 7470A. If possible, a dedicated 98624A is suggested.

7470A/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7470A Ordering Information

7470A	A/A4-size 2-pen plotter
Option 002	HP-IB interface (cable not included)
Option 905	Replace local power card with CEE-VI cord
07470-90001	7470A Interfacing and Programming Manual (one included w/7470A)
07470-90002	7470A Operator's Manual (one included w/7470A)
07470-90003	7470A Interconnection Guide (one included w/7470A)
07470-90004	7470A Reference Card (one included w/7470A)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
5061-5070	A-size paper/pen kit
5061-5071	A4-size paper/pen kit
5061-7561	Overhead transparency kit
7470A+49A-00	Self-paced hardware service training
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92177V	Personal Pen Organizer (holds 30 short-body pens)
92220R	0.3m right-angle HP-IB cable

7475A Plotter

The 7475A is an ANSI/ISO A/A4 or B/A3-size 6-pen plotter. It is the most economical B-size plotter.

7475A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7475A Option 002	B/A3-size plotter HP-IB interface	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7475A Option 002	B/A3-size plotter HP-IB interface	4.0	5.0	5.0	3.1

7475A Specification Summary

Data sheet (for complete specifications)	5953-9755
Dimensions	127mmH, 568mmW, 367mmD
Weight	7 kg (11 kg shipping)
Interface and command set	HP-IB, HP-GL
Paper sizes	ANSI A/B, ISO A4/A3
Pen speed	1 to 38cm/sec, 2g accel.
Resolution	0.025mm
Repeatability	0.1mm (0.2mm pen-to-pen)
Character set	USASCII, various ISO 7, HP9825
AC voltage required	100, 120, 220, 240 +5-10%
AC frequency tolerance	48 to 66 Hz
AC power required	35 W max.

7475A HP-IB Characteristics

SH1, AH1, T2, TE0, LE0, SR1, RL0, DC1, DT0, L2, PP0 (PP2 at addresses 0...7 or listen-only).

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7475A	B/A3-size plotter	1	0...30	1	N or H	0.0m	None

7475A/Series 300 Interfacing

Only the built-in HP-IB or 98624A support plotters such as the 7475A. Refer to 98624A for HP-IB cabling information.

7475A Switches	Sample Configuration
HP-IB address	5
A4/A3	Your choice
Met/US	Your choice

7475A/Series 300 BASIC Interfacing

Typical device specifier	`705`
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"`

7475A/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`D0046, L0046`
Starbase handler	`/usr/lib/libddhpgl.a`

7475A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-0**
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 7475A at select code 7, bus address 5

```
# mknod /dev/plt  c 7 0x070500
```

7475A/Series 300 HP-UX Considerations:

- The 7475A has no pacing protocol. When it is busy (plotting), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7475A. If you have a built-in and a 98624A interface, use the 98624A for the 7475A. If possible, a dedicated 98624A is suggested.

7475A/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7475A Ordering Information

7475A	B/A3-size 6-pen plotter
Option 002	HP-IB interface (cable not included)
Option 905	Replace local power card with CEE-VI cord
07475-90001	7475A Interfacing and Programming Manual (one included w/7475A)
07475-90002	7475A Operation and Interconnection Guide (one included w/7475A)
07475-90004	7475A Reference Card (one included w/7475A)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
5061-5070	A-size paper/pen kit
5061-5071	A4-size paper/pen kit
5061-7583	A-size overhead transparency kit
5061-7584	A4-size overhead transparency kit
7475A+49A	Self-paced hardware service training
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92177V	Personal Pen Organizer (holds 30 short-body pens)
92220R	0.3m right-angle HP-IB cable

7550A Plotter

The 7550A is an ANSI/ISO A/A4 or B/A3-size 8-pen HP-IB HP-GL plotter. It automatically feeds paper or transparency cut-sheet media from a tray. It is also HP's highest performance pen plotter.

7550A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7550A	B/A3-size 8-pen plotter	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7550A	B/A3-size 8-pen plotter	4.0	5.0	5.0	3.1

7550A Specification Summary

Data sheet (for complete specifications)	5953-9722
Dimensions	215mmH, 670mmW, 432mmD (no catcher) 215mmH, 670mmW, 896mmD (B-tray w/no catcher)
Weight	17.3 kg (25 kg shipping)
Interface and command set	HP-IB, HP-GL
Buffer size	1 to 12 Kbytes
Paper sizes	ANSI A/B, ISO A4/A3
Pen speed	1 to 80cm/sec, 6g accel.
Pen force	15 to 66 grams
Resolution	0.025mm (addressable) 0.006mm (mechanical)
Repeatability	0.1mm (0.2mm pen-to-pen)
Character set	ROMAN8, various ISO 7, HP9825, special symbols in stick and arc fonts
Configuration	from keyboard, battery-backed
AC voltage required	100, 120, 220, 240 +5-10%
AC frequency tolerance	48 to 66 Hz
AC power required	100 W max.

7550A HP-IB Characteristics

SH1, AH1, T6, L3, SR1, RL0, DC1, DT0, C0, PP0 (PP1 for addresses 8...30, PP2 for addresses 0...7).

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7550A	B/A3-size plotter	1	0...30	1	N or H	0.0m	None

7550A/Series 300 Interfacing

Only the HP-IB interface of the 7550A is supported. The RS-232C interface has not been tested and would probably require extra user programming in all operating systems. Only the built-in HP-IB or 98624A support plotters such as the 7550A. Refer to 98624A for HP-IB cabling information.

7550A Parameters	Sample Configuration
HP-IB address	5
Command mode	Standard
Handshake	None
Connection	Direct
Character frame	8-bits, no parity
Monitor mode	Off
Remote/Local	Remote
Bypass	On
Baud rate	9600
Paperload	Auto

7550A/Series 300 BASIC Interfacing

Typical device specifier	705
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"`

7550A/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`A0047, B0047, D0047, L0046`
Starbase handler	`/usr/lib/libddhpgl.a`

7550A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 7550A at select code 7, bus address 5

```
# mknod /dev/plt  c 7 0x070500
```

7550A/Series 300 HP-UX Considerations:

- The 7550A has no pacing protocol. When it is busy (plotting), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7550A. If you have a built-in and a 98624A interface, use the 98624A for the 7550A. If possible, a dedicated 98624A is suggested.

7550A/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7550A Ordering Information

7550A	B/A3-size 8-pen plotter
07550-60050	Pen carousel for fiber-tip transparency pens (one included with 7550A)
07550-60051	Pen carousel for fiber-tip paper pens (one included with 7550A)
07550-60052	Pen carousel for rollerball pens
07550-60053	Pen carousel for refillable pens
07550-60152	A-size media loading tray (one included for ANSI destinations)
07550-60158	A4-size media loading tray (one included for ISO destinations)
17525A	B-size media handling kit
17526A	A3-size media handling kit
07550-90001	7550A Interfacing and Programming Manual (one included w/7550A)
07550-90002	7550A Operation and Interconnection Guide (one included w/7550A)
07550-90003	7550A Pocket Guide (one included w/7550A)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
5061-5070	A-size paper/pen kit
5061-5071	A4-size paper/pen kit
5061-7583	A-size overhead transparency kit
5061-7584	A4-size overhead transparency kit
7550A+49A	Self-paced hardware service training
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92177V	Personal Pen Organizer (holds 30 short-body pens)
92220R	0.3m right-angle HP-IB cable

7580A/B Plotter

The 7580 is an ANSI/ISO A/A4 to D/A1-size 8-pen plotter. It is the most economical D-size plotter. The 7580A and 7580B differ primarily in that the choice of interface was an Option on the 7580A. Both HP-IB and RS-232C interfaces are standard on the 7580B. The 7580A is no longer supplied.

7580/Series 300 Support Summary

Various "system" Options to the 7580A/B provide an HP-IB interface. Any of these is acceptable for use with the Series 300.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7580A	D/A1-size 8-pen plotter						
Option 002	HP-IB Interface	NOP	Yes	Yes	4.0	5.0	3.1
7580B	D/A1-size 8-pen plotter	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7580A	D/A1-size 8-pen plotter				
Option 002	HP-IB interface	4.0	5.0	5.0	3.1
7580B	D/A1-size 8-pen plotter	4.0	5.0	5.0	3.1

7580B Specification Summary

Data sheet (for complete specifications)	5953-9724
Dimensions	1.188mH, 1.087mW, .557mD
Weight	59.1 kg (114 kg shipping)
Interface and command set	HP-IB, HP-GL
Buffer size	18432 bytes
Paper sizes	ANSI A/B/C/D, ISO A4/A3/A2/A1
Pen speed	1 to 60cm/sec, 4g accel.
Pen force	10 to 66 grams
Resolution	0.025mm (addressable) 0.003mm (mechanical)
Repeatability	0.10mm (0.2mm pen-to-pen)
Character set	ROMAN8, various ISO 7, HP9825, special symbols in stick and arc fonts
Configuration	switches
AC voltage required	100, 120, 220, 240 +5-10%
AC frequency tolerance	48 to 66 Hz
AC power required	182 W max.

7580 HP-IB Characteristics

SH1, AH1, T6, L3, SR1, RL0, DC1, DT0, C0, PP0 (PP1 for addresses 8...30, PP2 for addresses 0...7).

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7580A#002	D/A1-size plotter	1	0...30	1	N or H	0.0m	None
7580B	D/A1-size plotter	1	0...30	1	N or H	0.0m	None

7580/Series 300 Interfacing

Only the built-in HP-IB or 98624A support plotters such as the 7580. Refer to 98624A for HP-IB cabling information.

7580 Parameters	Sample Configuration
Interface mode	HP-IB
HP-IB address	5
EXPAND/NORMAL	NORMAL
EMULATE/NORMAL	NORMAL
STAND ALONE/EAVESDROP	STAND ALONE
MONITOR MODE/NORMAL	NORMAL
LOCAL/NORMAL	NORMAL

7580/Series 300 BASIC Interfacing

Typical device specifier	`705`
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"`

7580/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`D0006, L0006, P0006`
Starbase handler	`/usr/lib/libddhpgl.a`

7580/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 7580B at select code 7, bus address 5

```
# mknod /dev/plt  c 7 0x070500
```

7580/Series 300 HP-UX Considerations:

- The 7580 has no pacing protocol. When it is busy (plotting), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7580. If you have a built-in and a 98624A interface, use the 98624A for the 7580. If possible, a dedicated 98624A is suggested.

7580/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7580B Ordering Information

7580B Option 051	D/A1-size 8-pen plotter For use with Series 200/300 computers
07580-60050	Pen carousel for fiber-tip transparency pens (one included with 7580B)
07580-60035	Pen carousel for fiber-tip pens (one included with 7580B)
07580-60081	Pen carousel for drafting pens (one included with 7580B)
07580-60082	Pen carousel for rollerball pens (one included with 7580B)
07580-60240	Pen carousel for disposable drafting pens*
07580-90022	7580/85/86 Service Manual
07580-90033	7580/85/86 Operator's Manual (one included w/7580B)
07580-90034	7580/85/86 Interfacing and Programming Manual (one included w/7580B)
07580-90035	7580/85/86 Pocket Guide (one included w/7580B)
07580-90036	758X-series Preferred Media Guide (one included w/7580B)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
1540-0714	Writing accessories chest
5061-7577	Start-up disposable drafting pen kit
5953-4124	Interfacing and Handshaking Guide
5953-4161	Programmer's Reference Manual for HP-GL Plotters
5953-4163	Plotter Accuracy - What It Means and How to Achieve It
5953-9757	Long Axis Plotting with the HP 7586B
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92177V	Personal Pen Organizer (holds 30 short-body pens)

* For 7580B plotters with serial numbers of 2444Axxxxx or higher.

7585A/B Plotter

The 7585 is an ANSI/ISO A/A4 to E/A0-size 8-pen plotter. It is the most economical E-size plotter. The 7585A and 7585B differ primarily in that the choice of interface was an Option on the 7585A. Both HP-IB and RS-232C interfaces are standard on the 7585B. The 7585A is no longer supplied.

7585/Series 300 Support Summary

Various "system" Options to the 7585A/B provide an HP-IB interface. Any of these is acceptable for use with the Series 300.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7585A Option 002	E/A0-size 8-pen plotter HP-IB Interface	NOP	Yes	Yes	4.0	5.0	3.1
7585B	E/A0-size 8-pen plotter	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7585A Option 002	E/A0-size 8-pen plotter HP-IB interface	4.0	5.0	5.0	3.1
7585B	E/A0-size 8-pen plotter	4.0	5.0	5.0	3.1

7585B Specification Summary

Data sheet (for complete specifications)	5953-9724
Dimensions	1.188mH, 1.392mW, .557mD
Weight	70.4 kg (131 kg shipping)
Interface and command set	HP-IB, HP-GL
Buffer size	18432 bytes
Paper sizes	ANSI A/B/C/D/E, ISO A4/A3/A2/A1/A0
Pen speed	1 to 60cm/sec, 4g accel.
Pen force	10 to 66 grams
Resolution	0.025mm (addressable) 0.003mm (mechanical)
Repeatability	0.10mm (0.2mm pen-to-pen)
Character set	ROMAN8, various ISO 7, HP9825, special symbols in stick and arc fonts
Configuration	switches
AC voltage required	100, 120, 220, 240 +5-10%
AC frequency tolerance	48 to 66 Hz
AC power required	182 W max.

7585 HP-IB Characteristics

SH1, AH1, T6, L3, SR1, RL0, DC1, DT0, C0, PP0 (PP1 for addresses 8...30, PP2 for addresses 0...7).

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7585A#002	E/A0-size plotter	1	0...30	1	N or H	0.0m	None
7585B	E/A0-size plotter	1	0...30	1	N or H	0.0m	None

7585/Series 300 Interfacing

Only the built-in HP-IB or 98624A support plotters such as the 7585. Refer to 98624A for HP-IB cabling information.

7585 Parameters	Sample Configuration
Interface mode	HP-IB
HP-IB address	5
EXPAND/NORMAL	NORMAL
EMULATE/NORMAL	NORMAL
STAND ALONE/EAVESDROP	STAND ALONE
MONITOR MODE/NORMAL	NORMAL
LOCAL/NORMAL	NORMAL

7585/Series 300 BASIC Interfacing

Typical device specifier	`705`
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"`

7585/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`D0006, L0006, P0006`
Starbase handler	`/usr/lib/libddhpgl.a`

7585/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 7585B at select code 7, bus address 5

```
# mknod /dev/plt  c 7 0x070500
```

7585/Series 300 HP-UX Considerations:

- The 7585 has no pacing protocol. When it is busy (plotting), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7585. If you have a built-in and a 98624A interface, use the 98624A for the 7585. If possible, a dedicated 98624A is suggested.

7585/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7585B Ordering Information

7585B Option 051	E/A0-size 8-pen plotter For use with Series 200/300 computers
07580-60050	Pen carousel for fiber-tip transparency pens (one included with 7585B)
07580-60035	Pen carousel for fiber-tip pens (one included with 7585B)
07580-60081	Pen carousel for drafting pens (one included with 7585B)
07580-60082	Pen carousel for rollerball pens (one included with 7585B)
07580-60240	Pen carousel for disposable drafting pens*
07580-90033	758X Operator's Manual (one included w/7585B)
07580-90034	758X Interfacing and Programming Manual (one included w/7585B)
07580-90035	758X Pocket Guide (one included w/7585B)
07580-90036	758X-series Preferred Media Guide (one included w/7585B)
07585-90002	7585B Service Manual
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
1540-0714	Writing accessories chest
5061-7577	Start-up disposable drafting pen kit
5953-4124	Interfacing and Handshaking Guide
5953-4161	Programmer's Reference Manual for HP-GL Plotters
5953-4163	Plotter Accuracy - What It Means and How to Achieve It
5953-9757	Long Axis Plotting with the HP 7586B
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92177V	Personal Pen Organizer (holds 30 short-body pens)

* For 7585B plotters with serial numbers of 2444Axxxxx or higher.

7586B Plotter

The 7586B is a roll-feed version of the 7585B. The 7586B has a "long-axis" plotting capability implemented via optical sensors which can align individually plotted E-size frames. Although HP 9000 systems do not transparently support this feature, it is accessible by sending HP-GL commands directly to the plotter. Each frame would have to be plotted separately, using a different set of "world coordinates" to limit the source data plotted.

7586B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7586B	E/A0-size roll-feed plotter	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
7586B	E/A0-size roll-feed plotter	4.0	5.0	5.0	3.1

7586B Specification Summary

Data sheet (for complete specifications)	5953-9724
Dimensions	1.188mH, 1.392mW, .557mD
Weight	86.4 kg (148 kg shipping)
Interface and command set	HP-IB, HP-GL
Buffer size	18432 bytes
Paper sizes	ANSI A/B/C/D/E, ISO A4/A3/A2/A1/A0
Roll length	46m
Pen speed	1 to 60cm/sec, 4g accel.
Pen force	10 to 66 grams
Resolution	0.025mm (addressable) 0.003mm (mechanical)
Repeatability	0.10mm (0.2mm pen-to-pen)
Character set	ROMAN8, various ISO 7, HP9825, special symbols in stick and arc fonts
Configuration	switches
AC voltage required	100, 120, 220, 240 +5-10%
AC frequency tolerance	48 to 66 Hz
AC power required	182 W max.

7586B HP-IB Characteristics

SH1, AH1, T6, L3, SR1, RL0, DC1, DT0, C0, PP0 (PP1 for addresses 8...30, PP2 for addresses 0...7).

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7586B	E/A0-size plotter	1	0...30	1	N or H	0.0m	None

7586B/Series 300 Interfacing

Only the built-in HP-IB or 98624A support plotters such as the 7586B. Refer to 98624A for HP-IB cabling information.

7586B Parameters	Sample Configuration
Interface mode	HP-IB
HP-IB address	5
EXPAND/NORMAL	NORMAL
EMULATE/NORMAL	NORMAL
STAND ALONE/EAVESDROP	STAND ALONE
MONITOR MODE/NORMAL	NORMAL
LOCAL/NORMAL	NORMAL

7586B/Series 300 BASIC Interfacing

Typical device specifier	705
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"`

7586B/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`D0006, L0006, P0006`
Starbase handler	`/usr/lib/libddhpgl.a`

7586B/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 7586B at select code 7, bus address 5

```
# mknod /dev/plt  c 7 0x070500
```

7586/Series 300 HP-UX Considerations:

- The 7586 has no pacing protocol. When it is busy (plotting), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 7586. If you have a built-in and a 98624A interface, use the 98624A for the 7586. If possible, a dedicated 98624A is suggested.

7586B/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

7586B Ordering Information

7586B Option 051	E/A0-size 8-pen plotter For use with Series 200/300 computers
07580-60050	Pen carousel for fiber-tip transparency pens (one included with 7586B)
07580-60035	Pen carousel for fiber-tip pens (one included with 7586B)
07580-60081	Pen carousel for drafting pens (one included with 7586B)
07580-60082	Pen carousel for rollerball pens (one included with 7586B)
07580-60240	Pen carousel for disposable drafting pens*
07580-90033	758X Operator's Manual (one included w/7586B)
07580-90034	758X Interfacing and Programming Manual (one included w/7586B)
07580-90035	758X Pocket Guide (one included w/7586B)
07580-90036	758X-series Preferred Media Guide (one included w/7586B)
07586-90000	7586B Service Manual
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
1540-0714	Writing accessories chest
5061-7577	Start-up disposable drafting pen kit
5953-4124	Interfacing and Handshaking Guide
5953-4161	Programmer's Reference Manual for HP-GL Plotters
5953-4163	Plotter Accuracy - What It Means and How to Achieve It
5953-9757	Long Axis Plotting with the HP 7586B
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92177V	Personal Pen Organizer (holds 30 short-body pens)

* For 7586B plotters with serial numbers of 2444Axxxxx or later.

7906M/MR Disc

A 20 Mbyte (9.8 Mbyte fixed /9.8 Mbyte removable) AMIGO/MAC HP-IB disc drive. New applications should use the more economical (and higher capacity) 7907A. The 7906M is housed in a desk-height cabinet; the 7906MR is supplied as two 19-in. EIA rack-mountable components.

NOTE

This information is provided only for those who already have a 7906 and desire to transfer the data to a supported disc. This information applies *only* to recent 7906M and 7906MR Option 102 discs (i.e. 7906C/D disc, 13037C/D/U Multi-Access Controller (MAC) and 12745C/D HP-IB adaptor). There is no HP9000 interface for the 13037 controller *without* an HP-IB adaptor. The 7906H/HR ICD discs are known to *not work*. The usability of 7906S (slave) 7906A/B and 7905A discs is not known.

7906/Series 300 Support Summary

No 7906 support is planned for any HP9000 computer. Refer to "Interfacing" below. No diagnostic support exists for this disc in any system. The boot ROM code is not guaranteed to work and may be removed from future versions of the ROM.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7906M/MR	9.8/9.8 Mbyte ctg. disc.	Unsup.	Unsup.	Unsup.	No	Unsup.	No

The HP-UX 5.0 *mediainit* command does not yet support AMIGO discs. This capability is planned for 5.1. In the meantime, you may perform the initialization on most other systems which support AMIGO discs, then create the file system in HP-UX with *mkfs*.

7906 Selected Specifications

Interface and command set	HP-IB, AMIGO/MAC
Formatted capacity	9 830 400 bytes (fixed disc) 9 830 400 bytes (rem. disc)
Bytes per sector	256
Sectors per track	48
Tracks per surface	400 (plus 11 spare)
Surfaces per drive	4
Format options	None

12745C/D(7906) HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
12745C/D	HP-IB adaptor for MAC discs	1	0...7	1	High	0.9m	2.0m

7906/Series 300 Interfacing

Only the 98625 interface with 98620B DMA is likely to work. The 98625 interface must be set to interrupt level 6.

7906D/12745D Switches	Sample Configuration
Unit	0
Protect Upper	Off
Protect Lower	Off
RUN/STOP	RUN
Format	•
CPU number (S1)	0
HP-IB address (S2)	6 (supported disc at 0)

Although the suggested initial use is write enabled, Series 300 HP-UX supports access to write-protected media (except the root disc). The 7906 should be format-protected after *mediainit* and write-protected when copying data to a supported disc.

7906/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	2
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

7906/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=lower 1=upper	0

Typical *mknod*s for 7906 at select code 14, bus address 6

```
# mknod /dev/hd7906.0  b  2 0x0e0600
# mknod /dev/rhd7906.0 c 11 0x0e0600
# mknod /dev/hd7906.1  b  2 0x0e0610
# mknod /dev/rhd7906.1 c 11 0x0e0610
```

7906/Series 300 HP-UX Considerations:

- HP-UX will "complain" during bootup about the unsupported interrupt level 6 set on the 98625 interface. No supported discs should be connected to the same interface.
- The RUN/STOP switch of the 7906 does not "request release" from the host. You must assume responsibility for dismounting (*umount*) the cartridge before removing it, or I/O errors and possible file system corruption may occur. When the lower (fixed) platter is mounted, a busy system waits only five minutes for cartridge change (a 1:30 minute operation).

7906/Series 300 Pascal Interfacing

The AMIGO/MAC disc code was removed from the standard CTABLE at Pascal revision 3.0.

7907A Disc

A 41 Mbyte (20.5 Mbyte fixed /20.5 Mbyte removable-cartridge) CS/80 HP-IB disc drive in a 6.5 unit *Design Plus* cabinet. It is ideal for applications requiring: medium capacity removable media (8-in. disc cartridge), fast (push-button) backup or extreme ruggedness. A cartridge must be installed for the drive to operate.

7907A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7907A	20.5/20.5 Mbyte ctg. disc.	Rev. A	Yes	Yes	4.0	5.0	3.1

7907A Specification Summary

Data sheet (for complete specifications)	5953-3662 (5/85)
Dimensions	180.3mmH, 325.1mmW, 467.4mmD
Weight (drive, as shipped)	25 kg, 29.1 kg
Spin-up, spin-down time (seconds)	55, 22
Interface and command set	HP-IB, CS/80
Controller overhead	4 ms
Seek	10 ms track-to-track 29 ms average 55 ms full-stroke
Average latency	8.5 ms
Transfer rate	625 Kbytes/sec.
I/Os per second	22
Formatted capacity (fixed, removable)	20 545 536, 20 545 536
Formatted capacity (total)	41 091 072
Bytes per sector	256
Sectors per track	64
Tracks per surface	627
Surfaces per drive	4
Format options	None
AC voltage required	115
AC frequency tolerance	47.5 to 66 Hz
AC power required	195 VA typical
AC line drop tolerance	½ line cycle

7907A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7907A	41 Mbyte fixed/rem. disc	1	0...7	1	N or H	0.0m	1.0m
Option 550	Delete HP-IB cable	-	-	-	-	-	-1.0 m

7907A/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a 98625 at select code 14 and a 7907A at bus address 7. See 98624A and 98625 for HP-IB cabling rules.

7907A Switches	Sample Configuration
HP-IB address	7
WRITE PROTECT RUN/STOP	OFF RUN
97907A TAB	Write Enabled (installed)

Although the suggested initial use is write enabled, all Series 300 operating systems support access to write-protected media (except the root disc in HP-UX).

7907A/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	`:,1407,0` or `:CS80,1407,0` (fixed disc) `:,1407,1` or `:CS80,1407,1` (removable disc)
Binaries required	CS80 and HPIB or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	2

Although ideal for specific applications requiring its unique advantages, the 7907A is not recommended for general purpose BASIC use because it has only two 20.5 Mbyte volumes (i.e. only two LIF directories). This is inconvenient when many files are present. Additionally, other discs are more economical if removability is not required.

7907A/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	2
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

7907A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=lower 1=upper	0

Typical *mknod*s for 7907A at select code 14, bus address 7

```
# mknod /dev/hd7907.0  b 0 0x0e0700
# mknod /dev/rhd7907.0 c 4 0x0e0700
# mknod /dev/hd7907.1  b 0 0x0e0710
# mknod /dev/rhd7907.1 c 4 0x0e0710
```

7907A/Series 300 HP-UX Considerations:

- The 7907A may be used as the sole HP-UX 5.1 system disc (plus one mounted volume) or as add-on mounted volumes. If used as the sole system disc, another disc or tape drive with a supported 3½-in. double-sided flexible disc drive or ¼-in cartridge tape drive must be available for software installation. The 7907A does not have adequate capacity for installing the HP-UX 5.0 system.
- HP-UX does acknowledge the RUN/STOP switch of the 7907A and grant release. The cartridge should always be dismounted (*umount*) before removing it, or I/O errors and possible file system corruption may occur. When the lower (fixed) platter is mounted (e.g. is the *root* or VM disc), a busy system waits only five minutes for cartridge change (a 1:30 minute operation).
- Backup operations available using the removable cartridge: push-button, *dd* (copy platter), *tar* and *cpio*.

7907A/Series 300 Pascal Interfacing

Recommended interleave	1
Default volumes	:11.....
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	2 to 30

7907A Ordering Information

7907A	41 Mbyte disc drive
Option 015	240 Vac 50 Hz operation
Option 550	Delete 1.0m HP-IB cable
97907A	20.5 Mbyte disc cartridge (one included w/7907A)
19507A	19-in. EIA rack-mount adaptor
07907-90901	Disc Drive Owner's manual (one included w/7907A)
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives

7908P/R Disc/Tape

A medium performance 16.6 Mbyte fixed (non-removable) CS/80 HP-IB disc and ¼-in. "88140" shared-controller cartridge tape drive. The 7908P is housed in a desk-height roll-around cabinet. The 7908R is housed in a 19-in. rack-mountable enclosure. The 7908 is no longer supplied, having been replaced by the 7942A. Push-button disc→tape and tape→disc operations are provided. The 7908P/R Option 140 deleted the tape drive. There was no Option to provide a dual-controller tape drive.

7908/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7908P	16.6 Mbyte disc/tape	Rev. A	Planned	Planned	4.0	5.0	3.1
7908R	16.6 Mbyte disc/tape	Rev. A	Planned	Planned	4.0	5.0	3.1
Option 140	delete tape drive	Rev. A	Planned	Planned	4.0	5.0	3.1

7908 Selected Specifications

Interface and command set	HP-IB, CS/80
Seek time	5 ms track-to-track 41.6 ms average 70 ms full stroke
Average latency	8.33 ms
Transfer rate	1.0 Mbytes/sec. burst 537 Kbytes/sec. max.
I/Os per second	16
Formatted capacity	16 576 000
Bytes per sector	256
Sectors per track	35 (plus 1 spare)
Tracks per surface	370 (plus 6 spare, 4 maint.)
Surfaces per drive	5
Format options	None
Tape drive specifications	Refer to 88140

7908 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7908P	16.6 Mbyte disc/tape	1	0...7	1	H or N	1.0m	2.0m
7908R	16.6 Mbyte disc/tape	1	0...7	1	H or N	0.0m	2.0m

The disc is unit 0 and the tape (if present) is unit 1. Deleting the tape does not otherwise affect the HP-IB characteristics.

7908/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA provides significant performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a 98625 at select code 14 and a 7908 at bus address 3. See 98624A and 98625 for HP-IB cabling rules.

7908 Switches	Sample Configuration
HP-IB address	3

7908/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	:,1403,0 or :CS80,1403,0 (disc) :,1403,1 or :CS80,1403,1 (tape)
Binaries required	CS80 and HPIB or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

7908/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	cs80
Block-mode major number	0
Character-mode major number	4

7908/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=disc 1=tape	0

Typical *mknod*s for 7908 at select code 14, bus address 3

```
# mknod /dev/hd7908  b 0 0x0e0300
# mknod /dev/rhd7908 c 4 0x0e0300
# mknod /dev/ct7908  b 0 0x0e0310
# mknod /dev/rct7908 c 4 0x0e0310
```

7908/Series 300 HP-UX Considerations:
The 7908 has adequate performance for one or two users. It does not have adequate capacity for more than the AXE, Programming Environment and one language.

7908/Series 300 Pascal Interfacing

Recommended interleave	1
Default volumes	:11 to 36 (16, disc only) 15 are 1 030 400, last is 1 120 000 :41 (tape)
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file).

7911 Disc/Tape

A high-performance 28.1 Mbyte fixed (non-removable) CS/80 HP-IB disc and "88140" ¼-in. cartridge tape drive. The 7911P is housed in a desk-height roll-around cabinet. The 7911R is housed in a 19-in. rack-mountable enclosure. For new applications a 7942A plus a 7941A will provide 47 Mbytes at about the same price and performance.

The standard 7911 has a shared-controller tape drive, providing push-button disc→tape and tape→disc operations. 7911P/R Option 140 deletes the tape drive. 7911P/R Option 001 provides a separate-controller tape drive. Push-button is not available with Options 001 and 140.

7911/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7911P	28.1 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1
7911R	28.1 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	Sep. tape controller	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 140	Delete tape drive	Rev. A	Yes	Yes	4.0	5.0	3.1

7911 Specification Summary

Data sheet (for complete specs.)	5953-3651
Dimensions (7911P)	720mmH, 354mmW, 711mmD
(7911R)	311mmH, 482mmW, 696mmD (behind rack ears)
Weight (7911P)	85.4 kg (117.1 kg shipping)
(7911R)	67.2 kg (89.9 kg shipping)
Interface and command set	HP-IB, CS/80
Disc characteristics:	
Controller overhead	4.0 ms
Seek time	5 ms track-to-track
	27.1 ms average
	50 ms full stroke
Average latency	8.3 ms
Transfer rate	1.0 Mbytes/sec. maximum
	983 kbytes/sec. average*
I/Os per second	25
Formatted capacity	28114944
Bytes per sector	256
Sectors per track	64
Tracks per surface	572 (plus 8 spare, 2 maint.)
Surfaces per drive	3
Format options	None
Tape drive characteristics	refer to 88140
AC voltage required	110, 120, 220, 240 +5-10%
AC frequency tolerance	50, 60 Hz +10-5%
AC power required	700 Watts max.
AC line drop tolerance	one half line cycle

* Continuous disc I/O rate in an operating system is lower.

7911 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7911P	28.1 Mbyte disc/tape	1	0...7	1	H or N	1.0m	1.0m
Option 001	sep. tape controller	+1	0...7	+1	H or N	+1.0m	+1.0m
7911R	28.1 Mbyte disc/tape	1	0...7	1	H or N	0.0m	2.0m
Option 001	sep. tape controller	+1	0...7	+1	H or N	-	+2.0m

The disc drive is always UNIT 0. The tape drive (if present) is UNIT 1 in shared-controller (std.) discs and UNIT 0 in separate-controller (Option 001) discs. Option 140 (delete tape drive) does not affect the HP-IB characteristics.

7911/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a 98625 at select code 14 and a 7911 (no Option) at bus address 3. See 98624A and 98625 for HP-IB cabling rules. If you have Option 001 (separate controller tape), the tape may be connected to any available HP-IB interface.

7911 Switches	Sample Configuration
HP-IB address	3

7911/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	`:,1403,0` or `:CS80,1403,0` (disc) `:,1403,1` or `:CS80,1403,1` (tape)
Binaries required	CS80 and HPIB or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7911 should not be selected for use in a BASIC application unless its high performance is a requirement. The single LIF directory is very inconvenient when many files are present. Any of several SS/80 discs can be combined to provide similar capacities and up to 8 LIF directories per drive on separately addressable volumes.

7911/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file).

7911/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex) 7911 Std.	07 to 1F	00 to 07	0=disc 1=tape	0

For 7911P/R Option 001, the "Unit Number" field for the tape drive is zero (at a different HP-IB Address, and possibly a different select code).

Typical *mknod*s for 7911 at select code 14, bus address 3

```
# mknod /dev/hd7911   b 0 0x0e0300
# mknod /dev/rhd7911  c 4 0x0e0300
# mknod /dev/ct7911   b 0 0x0e0310
# mknod /dev/rct7911  c 4 0x0e0310
```

7911/Series 300 HP-UX Considerations:

- The 7911 has adequate performance for multi-user HP-UX. It does not have adequate capacity for a full HP-UX 5.0 system.
- Disc I/O can slow to 1 I/O per second during tape operations (such as backup). For this reason, the separate controller (Option 001) is recommended. It is also suggested that the tape drive be placed on a separate bus from the disc. It is possible to convert a shared-controller disc to separate-controller. Contact your HP Customer Engineer (CE) for details.

7911/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	`Q`
Default volumes	:11...37 (27 total) 26 are 1 032 192 bytes; last is 1 277 952 bytes
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7911 Ordering Information

7911P	28.1 Mbyte disc/tape in roll-around cabinet, w/1.0m HP-IB cable
Option 001	Adds separate controller and HP-IB cable for tape drive
Option 015	220 Vac 50 Hz operation
Option 140	Delete tape drive
7911R	28.1 Mbyte disc/tape, 19-in. EIA rack mountable, w/2.0m HP-IB cable
Option 001	Adds separate controller and HP-IB cable for tape drive
Option 015	220 Vac 50 Hz operation
Option 140	Delete tape drive
07912-90901	7911/12/14 Disc Drive Owner's manual (one included w/7911)
07912-90902	7911/12/14 Operating and Installation manual (one included w/7911)
07911-90903	7911/12/14 Disc Drive Service manual
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
9300-0767	Head cleaning swabs (box of 50) (10 included w/7911)
92193F	Magnetic head cleaning solution

7912 Disc/Tape

A high-performance 65.6 Mbyte fixed (non-removable) CS/80 HP-IB disc and ¼-in. "88140" cartridge tape drive. The 7912P is housed in a desk-height roll-around cabinet. The 7912R is housed in a 19-in. rack-mountable enclosure.

The standard 7912 has a shared-controller tape drive (which supports push-button disc→tape and tape→disc copy. 7912P/R Option 140 deletes the tape drive. 7912P/R Option 001 provides a separate-controller tape drive. Push-button is not available with Options 001 and 140.

7912/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7912P	65.6 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1
7912R	65.6 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	Sep. tape controller	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 140	Delete tape drive	Rev. A	Yes	Yes	4.0	5.0	3.1

7912 Specification Summary

Data sheet (for complete specs.)	5953-3651
Dimensions (7912P)	720mmH, 354mmW, 711mmD
(7912R)	311mmH, 482mmW, 696mmD (behind rack ears)
Weight (7912P)	85.4 kg (117.1 kg shipping)
(7912R)	67.2 kg (89.9 kg shipping)
Interface and command set	HP-IB, CS/80
Disc characteristics:	
Controller overhead	4.0 ms
Seek time	5 ms track-to-track
	27.1 ms average
	50 ms full stroke
Average latency	8.3 ms
Transfer rate	1.0 Mbytes/sec. maximum
	983 kbytes/sec. average*
I/Os per second	25
Formatted capacity	65 601 536 bytes
Bytes per sector	256
Sectors per track	64
Tracks per surface	572 (plus 8 spare, 2 maint.)
Surfaces per drive	7
Format options	None
Tape drive specifications	refer to 88140
AC voltage required	110, 120, 220, 240 +5-10%
AC frequency tolerance	50, 60 Hz +10-5%
AC power required	700 Watts max.
AC line drop tolerance	one half line cycle

* Continuous disc I/O rate in an operating system is lower.

7912 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7912P	65.6 Mbyte disc/tape	1	0...7	1	H or N	1.0m	1.0m
Option 001	sep. tape controller	+1	0...7	+1	H or N	+1.0m	+1.0m
7912R	65.6 Mbyte disc/tape	1	0...7	1	H or N	0.0m	2.0m
Option 001	sep. tape controller	+1	0...7	+1	H or N	-	+2.0m

The disc drive is always UNIT 0. The tape drive (if present) is UNIT 1 in shared-controller (std.) discs and UNIT 0 in separate-controller (Option 001) discs. Option 140 (delete tape drive) does not affect the HP-IB characteristics.

7912/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a 98625 at select code 14, built-in HP-IB at 7 and a 7912 Option 001 at bus addresses 0 and 2. See 98624A and 98625 for HP-IB cabling rules.

7912 Switches	Sample Configuration
Disc HP-IB address	0
Tape HP-IB address (Option 001 only)	2

7912/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	:,1400,0 or :CS80,1400,0 (disc) :,702,0 or :CS80,702,0 (tape)
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7912 should not be selected for use in a BASIC application unless its high performance is a requirement. The single LIF directory is very inconvenient when many files are present. Any of several SS/80 discs can be combined at a lower price to provide similar capacities and up to 8 LIF directories/drive on separately addressable volumes.

7912/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	cs80
Block-mode major number	0
Character-mode major number	4

* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file).

7912/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex) 7912 Std.	07 to 1F	00 to 07	0=disc 1=tape	0
7912 Opt. 001 Tape	07 to 1F 07 to 1F	00 to 07 00 to 07	0 0	0 0

For 7912P/R Option 001, the "Unit Number" field for the tape drive is zero (at a different HP-IB Address, and possibly a different select code).

Typical *mknod*s for 7912P Option 001 (as sole system disc) at select code 14, bus address 0 and tape at select code 7 bus address 2.

```
# mknod /dev/hd    b 0 0x0e0000
# mknod /dev/rhd   c 4 0x0e0000
# mknod /dev/ct    b 0 0x070210
# mknod /dev/rct   c 4 0x070210
```

7912/Series 300 HP-UX Considerations:

- The 7912 has adequate performance and capacity for multi-user HP-UX.
- Disc I/O can slow to 1 I/O per second during tape operations (such as backup). For this reason, the separate controller (Option 001) is recommended. It is also suggested that the tape drive be placed on a separate bus from the disc. It is possible to convert a shared-controller disc to separate-controller. Contact your HP Customer Engineer (CE) for details.

7912/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volumes	:11...40 (30 total, disc only) 29 are 2 179 072 bytes; last is 2 408 448 bytes :41 (tape)
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7912 Ordering Information

7912P	65.6 Mbyte disc/tape in roll-around cabinet, w/1.0m HP-IB cable
Option 001	Adds separate controller and HP-IB cable for tape drive
Option 015	220 Vac 50 Hz operation
Option 140	Delete tape drive
7912R	65.6 Mbyte disc/tape, 19-in. EIA rack mountable, w/2.0m HP-IB cable
Option 001	Adds separate controller and HP-IB cable for tape drive
Option 015	220 Vac 50 Hz operation
Option 140	Delete tape drive
07912-90901	7912/12/14 Disc Drive Owner's manual (one included w/7912)
07912-90902	7912/12/14 Operating and Installation manual (one included w/7912)
07912-90903	7912/12/14 Disc Drive Service manual
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
9300-0767	Head cleaning swabs (box of 50) (10 included w/7912)
92193F	Magnetic head cleaning solution

7914CT/P/R Disc/Tape

A high-performance 132.1 Mbyte fixed (non-removable) CS/80 HP-IB disc and ¼-in. cartridge tape drive. The 7914 is available in five different products. Three are described here:

- The 7914CT is housed in a *Design-Plus* roll-around rack and includes a (separate-controller) ¼-in. 9144 cartridge tape drive. This product is essentially a 7914R Option 140 and a 9144A in a 92211R rack.
- The 7914P is housed in a desk-height roll-around cabinet and includes a (shared-controller) "88140" ¼-in. tape drive.
- The 7914R is housed in a 19-in. rack-mountable enclosure and includes a (shared-controller) "88140" ¼-in. tape drive.
- The 7914ST and 7914TD include a 9-track ½-in. magnetic tape drive and are described separately.

Of the 7914CT and 7914P, the 7914CT is the suggested drive. It provides a separate-controller read-after-write tape for the same price as the standard 7914P (which has a shared-controller tape without read-after-write.)

The standard 7914P/R has a shared-controller tape drive, providing push-button disc→tape and tape→disc operations. 7914CT/P/R Option 140 deletes the tape drive. 7914P/R Option 001 provides a separate-controller "88140" tape drive. Refer to "88140" for a discussion of the 7914P/R tape drive. Refer to 9144A for a discussion of the 7914CT tape drive. Push-button is not available with the 7914CT or with 7914P/R Options 001 and 140.

Push-button backup on the the 7914P/R requires two tape cartridges. Unlike 7908/11/12/42/46 push-button tapes, 7914 tapes are *not* accessible as file systems in any HP9000 operating system.

In certain markets the 7914CT is ordered as separate product numbers 35414CT and 9144A - see the ordering information at the end of this section.

7914CT/P/R-Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7914CT	132.1 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 140	Delete 9144A tape	Rev. A	Yes	Yes	4.0	5.0	3.1
7914P	132.1 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	Sep. tape controller	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 140	Delete 88140 tape	Rev. A	Yes	Yes	4.0	5.0	3.1
7914R	132.1 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	Sep. tape controller	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 140	Delete 88140 tape	Rev. A	Yes	Yes	4.0	5.0	3.1

7914CT/P/R Specification Summary

Data sheets (for complete specs.)	5953-3651, 5954-1952
Dimensions (7914CT)	720mmH, 375mmW, 777mmD
(7914P)	720mmH, 354mmW, 711mmD
(7914R)	311mmH, 482mmW, 696mmD (behind rack ears)
Weight (7914CT)	109 kg (135+9 kg shipping)
(7914P)	85.4 kg (117.1 kg shipping)
(7914R)	67.2 kg (89.9 kg shipping)
Interface and command set	HP-IB, CS/80
Disc characteristics:	
Controller overhead	4.0 ms
Seek time	5 ms track-to-track
	28.1 ms average
	50 ms full stroke
Average latency	8.3 ms
Transfer rate	1.0 Mbytes/sec. maximum
	983 kbytes/sec. average*
I/Os per second	23
Formatted capacity	132 120 576 bytes
Bytes per sector	256
Sectors per track	64
Tracks per surface	1152 (plus 8 spare, 2 maint.)
Surfaces per drive	7
Format options	None
Tape drive characteristics	Refer to 88140 or 9144
AC voltage required	110, 120, 220, 240 +5-10%
AC frequency tolerance	50, 60 Hz +10-5%
AC power required	700 Watts max.
AC line drop tolerance	one half line cycle

7914CT/P/R HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7914CT	132.1 Mb disc/tape	1+1	0...7	1+1	H or N	1.0m (disc)	1.0m
Option 140	delete 9144A tape	-1	-	-1	-	-	-
7914P	132.1 Mb disc/tape	1	0...7	1	H or N	1.0m	1.0m
Option 001	sep. tape controller	+1	0...7	+1	H or N	+1.0m	+1.0m
7914R	132.1 Mb disc/tape	1	0...7	1	H or N	0.0m	2.0m
Option 001	sep. tape controller	+1	0...7	+1	H or N	-	+2.0m

The disc drive is always UNIT 0. The tape drive (if present) is UNIT 1 in 7914P/R (std.) shared-controller discs and UNIT 0 in the 7914CT and 7914P/R Option 001 discs. Option 140 (delete tape drive) does not affect the HP-IB characteristics of the 7914P/R.

* Continuous disc I/O rate in an operating system is lower.

7914CT/P/R-Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a 98625 at select code 14, built-in interface at select code 7 and a 7914CT at bus addresses 0 (disc) and 4 (tape). See 98624A and 98625 for HP-IB cabling rules. If you have 7914CT or 7914P/R Option 001 (separate controller tape), the tape may be connected to any available HP-IB interface.

7914/9144A Switches	Suggested Initial Configuration
7914 HP-IB address	0
9144 HP-IB address	4

7914CT/P/R-Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	:,1400,0 or :CS80,1400,0 (disc) :,704,0 or :CS80,704,0 (tape)
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7914 should not be selected for use in a BASIC application unless its capacity or high performance is a requirement. The single LIF directory is very inconvenient when many files are present.

7914CT/P/R-Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	cs80
Block-mode major number	0
Character-mode major number	4

* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file). Tapes produced by 7914 push-button backup **are not mountable**.

7914CT/P/R-Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex) **7914CT Std.** **7914P/R Opt. 001**	07 to 1F 07 to 1F	00 to 07 00 to 07	0=disc 0=tape	0 0
Values (hex) **7914P/R Std.**	07 to 1F	00 to 07	0=disc 1=tape	0

For a 7914CT or a 7914P/R Option 001, the "Unit Number" field for the tape drive is zero (at a different HP-IB Address, and possibly a different select code).

Typical *mknod*s for 7914CT (as sole system disc) at select code 14, bus address 0 and tape at select code 7 bus address 4.

```
# mknod /dev/hd    b 0 0x0e0000
# mknod /dev/rhd   c 4 0x0e0000
# mknod /dev/ct    b 0 0x070400
# mknod /dev/rct   c 4 0x070400
```

7914CT/P/R-Series 300 HP-UX Considerations:

- The 7914 has adequate performance and capacity for multi-user HP-UX.
- Disc I/O can slow to 1 I/O per second during shared-controller tape operations (such as backup). For this reason, the separate controller (7914CT or 7914P/R Option 001) is recommended. It is also suggested that the tape drive be placed on a separate bus from the disc. It is possible to convert a 7914P/R shared-controller disc to separate-controller. Contact your HP Customer Engineer (CE) for details.

7914CT/P/R-Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volumes	:11...40 (for disc, 30 total) 29 are 4 390 912 bytes; last is 4 784 128 bytes :41 (for tape)
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7914CT/P/R Ordering Information

7914CT	132.1 Mbyte disc/tape in roll-around cabinet, w/1.0m HP-IB cable
Option 015	220 Vac 50 Hz operation
Option 140	Delete tape drive
Note	In U.S.A. and HP-ICON countries, order:
35414CT	132.1 Mbyte disc in roll-around cabinet, w/1.0m HP-IB cable
Option 015	220 Vac 50 Hz operation
9144A	16/67 Mbyte cartridge tape drive
7914P	132.1 Mbyte disc/tape in roll-around cabinet, w/1.0m HP-IB cable
Option 001	Adds separate controller and HP-IB cable for tape drive
Option 015	220 Vac 50 Hz operation
Option 140	Delete tape drive
7914R	132.1 Mbyte disc/tape, 19-in. EIA rack mountable, w/2.0m HP-IB cable
Option 001	Adds separate controller and HP-IB cable for tape drive
Option 015	220 Vac 50 Hz operation
Option 140	Delete tape drive
07912-90901	7914/12/14 Disc Drive Owner's manual (one included w/7914)
07912-90902	7914/12/14 Operating and Installation manual (one included w/7914)
07912-90903	7914/12/14 Disc Drive Service manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
5955-3442	CS/80 Instruction Set Programming manual
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
9300-0767	Head cleaning swabs (box of 50) (10 included w/7914)
92193F	Magnetic head cleaning solution

7914ST Disc/Tape

A high-performance 132.1 Mbyte fixed (non-removable) CS/80 HP-IB disc and 1600 cpi PE ½-in. 9-track tape drive. The 7914 disc is also available in four other configurations. See 7914CT/P/R and 7914TD.

Note - The standard 7914ST *does not include* a cartridge tape drive.

The 7914ST is essentially a 7914R Option 140 (no cartridge tape) and a 7974A in a single cabinet. This section describes only the information unique to the 7914ST package.

The 7914ST Option 240 has a shared-controller tape drive, providing push-button disc→tape and tape→disc operations. 7914ST Option 002 provides a separate-controller tape drive. Push-button is not available with Option 002 (or the standard 7914ST). The two-tape comments of the 7914P/R section apply.

7914ST/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7914ST	132.1 Mbyte disc/tape	Rev. A	Planned	Planned	No	5.0	No*
Option 002	Add sep.-cntrlr "88140"	Rev. A	Planned	Planned	No	5.0	No*
Option 114	Add second 7914R#140	Rev. A	Planned	Planned	No	5.0	No*
Option 240	Add shared-cntrlr "88140"	Rev. A	Planned	Planned	No	5.0	No*
Option 800	Add 800 cpi to 7974A	NOP	Planned	Planned	No	5.0	No*

The Rev. A boot ROM supports only the 7914 disc drive(s) and optional "88140" cartridge tape drive, and not the 7974A tape drive. BASIC and Pascal can access the 7914 and "88140", but there is presently no BASIC or Pascal driver support for the 7974A.

7914ST Specification Summary

Data sheet (for complete specifications)	5953-3644
Dimensions	160cmH, 63cmW, 81cmD
Weight (standard)	269.0 kg (294.8 kg shipping)
(Option 114)	332.5 kg (383.7 kg shipping)
Interface and command set	HP-IB, CS/80 and 7974
7914R disc characteristics	refer to 7914R
7974R tape characteristics	refer to 7974A
Cartridge tape characteristics	refer to 88140
AC voltage and frequency	refer to 7914R and 7974A
AC power required (standard)	1250 Watts max.
(Option 002 or 240)	adds 50 Watts
(Option 114)	adds 650 Watts

* A Pascal-based file transfer utility program for the 7974A is part of the 98310A HP/EGS Photo-plotter/NC software. It is not available separately.

7914ST HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7914ST	132.1 Mb disc/tape						
	132 Mb 7914R#140 disc	1	0...7	1	H or N	0.0m	2.0m
	7974A tape drive	1	0...7	1	H or N	1.0m	2.0m
Option 002	sep. cntrlr 88140	+1	0...7	+1	H or N	+1.0m	+2.0m
Option 114	2nd 7914R#140 disc	+1	0...7	+1	H or N	-	+2.0m
Option 240	single cntrlr 88140	-	-	-	-	-	-
Option 800	add 800 cpi NRZI	-	-	-	-	-	-

The disc drive is always UNIT 0. The Option 240 cartridge tape drive is UNIT 1. The Option 002 cartridge tape drive is UNIT 0. The 7974A has no "unit" addressing.

7914ST/Series 300 Interfacing

Any HP-IB interface is suitable. 98620B DMA is strongly suggested for adequate 7974A performance. A 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. See 98624A and 98625 for HP-IB cabling rules.

The 7974A tape should be connected to the 98625 interface or the built-in interface, even if that interface is also used for the system disc. The 7974 uses a very efficient command set and (when in use) will not degrade disc performance by more than 10%.

The Option 002 separate controller cartridge tape may be connected to any available HP-IB interface. See "HP-UX Considerations" below for further discussion.

The examples which follow assume a 98625 at select code 14, built-in interface at select code 7 and a 7914ST Option 002 at addresses 0 (disc), 4 (7974) and 2 (88140).

7914ST Switches	Sample Configuration
7914 HP-IB address	0
7974A HP-IB address	4
88140 HP-IB address	2

7914ST/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Drivers required	`cs80, 7974`
Block-mode major number	0 (CS/80)
Character-mode major number	4 (CS/80)
	9 (7974)

* 7908/11/12/42/46disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file). Tapes produced by 7914 push-button backup **are not mountable.**

7914ST/Series 300 HP-UX Driver Minor Number

CS/80 Driver (number 0/4)

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex) 7914ST#002	07 to 1F 07 to 1F	00 to 07 00 to 07	0=disc 0=tape	0 0
Values (hex) 7914ST#240	07 to 1F	00 to 07	0=disc 1=tape	0

7974 Driver (number 9)

Bits	23-16	15-8	7-6	5-4	3	2	1	0
Fields	Select Code	HP-IB Address	Tape Density	Not Used	EOT Semantics	Immediate Report	EOR/EOF Semantics	Close Semantics
Values (Hex) 7974A	07 to 1F	00 to 07	00= 800 01=1600 10=6250	0	0=Industry 1=HP-UX 2.0	0=Enabled 1=Disabled	0=AT&T 1=Berkeley	0=Rewind 1=NOP

For a 7914ST Option 002, the "Unit Number" field for the cartridge tape drive is zero (at a different HP-IB Address, and possibly a different select code).

Typical *mknod*s for 7914ST Option 002 and 800 (as sole system disc) at select code 14, bus address 0 and cartridge tape at select code 7 bus address 2. The 7974 is on bus 14 at address 4, with "Berkeley" semantics.

```
# mknod /dev/hd       b 0 0x0e0000
# mknod /dev/rhd      c 4 0x0e0000
# mknod /dev/mt800    c 9 0x0e0402
# mknod /dev/mt1600   c 9 0x0e0442
# mknod /dev/ct       b 0 0x070210
# mknod /dev/rct      c 4 0x070210
```

7914ST/Series 300 HP-UX Considerations:

- The 7914 has adequate performance and capacity for multi-user HP-UX.
- The "immediate report" mode is more likely to keep the drive "streaming". Without DMA, HP-UX may not be able to keep the drive streaming. However, even with DMA and the 98625 interface, the rate at which you can write data to the tape is typically limited by the rate at which you can collect/create the data. For example, the standard backup utilities *cpio* and *tar* cannot locate and read disc files fast enough to keep the 7974 streaming.
- Disc I/O can slow to one I/O per second during shared-controller cartridge tape operations (such as backup). For this reason, the separate controller (7914ST Option 002) is recommended. It is also suggested that the cartridge tape drive be placed on a separate bus from the disc. It is possible to convert a 7914ST Option 240 shared-controller disc to separate-controller. Contact your HP Customer Engineer (CE) for details. If you already have a 7914ST with *no* cartridge tape drive, it is more economical to purchase a stand-alone 9144A.

7974/Series 300 Pascal Interfacing

The utility program supplied with 98305A HP EGS requires that the 7974A be connected to a 98625 interface and that a 98620 DMA card be present.

7914ST Ordering Information

7914ST	132.1 Mbyte disc and 7974A tape in upright cabinet (includes 2 ×2.0m HP-IB cables)
Option 002	Add separate-controller "88140" cartridge tape drive
Option 015	220 Vac 50 Hz operation
Option 114	Add second 7914R#140 disc drive (without tape drive)
Option 240	Add shared-controller "88140" cartridge tape drive
Option 800	Add 800 cpi NRZI capability to 7974A
07912-90901	7914/12/14 Disc Drive Owner's manual (one included w/7914)
07912-90902	7914/12/14 Operating and Installation manual (one included w/7914)
07912-90903	7914/12/14 Disc Drive Service manual
07914-90912	7914ST Installation and Service manual (one included w/7914ST)
07974-90000	7974A Operator's manual (one included w/7914ST)
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
92150D	10 600-ft. reels of tape in seals
92150E	10 1200-ft. reels of tape in seals
92150F	10 2400-ft. reels of tape in seals (one reel included w/7914ST)
92150K	Tape labels (box of 1000)
92150L	Color coded tape numbering kit
92150M	BOT/EOT sense markers (card of 250)
92150T	Six-reel media transit case
92193F	Magnetic head cleaning solution
92260T	Tape rack (for 15 ½-in. reels)
92272D	175-reel tape storage cabinet
92272F	300-reel tape library storage rack
9300-0767	Head cleaning swabs (box of 50) (10 included w/7914)

7914TD Disc/Tape

A high-performance 132.1 Mbyte fixed (non-removable) CS/80 HP-IB disc and 1600 cpi PE ½-in. 9-track tape drive. The 7914 disc is also available in four other configurations. See 7914CT/P/R and 7914ST. Select the 7914ST for new applications, as it provides streaming and optional 800 cpi NRZI format. The 7914TD will no longer be supplied after November 1, 1985.

The 7914TD is essentially a 7914R Option 140 (no cartridge tape) plus a modified 7971A Option 840 (HP-IB master). The 7971A is essentially a 7970E Option 836 in a 26078A cabinet. This section describes only the information unique to the 7914TD package.

Note - The standard (no Option) 7914TD *does not* include a cartridge tape drive. Push-button backup/restore (between disc and cartridge tape *only*) is available only with shared-controller cartridge tape Option 240. The two-tape comments of the 7914P/R section apply.

7914TD/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7914TD	132.1 Mbyte disc/tape	Rev. A	Planned	Planned	No	5.0	No
Option 002	Add sep.-cntrlr "88140"	Rev. A	Planned	Planned	No	5.0	No
Option 114	Add second 7914R#140	Rev. A	Planned	Planned	No	5.0	No
Option 240	Add shared-cntrlr "88140"	Rev. A	Planned	Planned	No	5.0	No

The Rev. A boot ROM supports only the 7914 disc drive(s) and optional "88140" cartridge tape drive, and not the 7971A tape drive. BASIC and Pascal can access the 7914 and "88140", but there is no BASIC or Pascal driver support for the 7971A.

7914TD Specification Summary

Data sheet (for complete specifications)	5953-3633
Dimensions	161cmH, 64cmW, 81cmD
Weight (standard)	272.2 kg (364.7 kg shipping)
(Option 114)	335.7 kg (453.6 kg shipping)
Interface and command set	HP-IB, CS/80 and 7970
7914R disc characteristics	refer to 7914R
7974R tape characteristics	refer to 7971A
"88140" tape characteristics	refer to 88140
AC voltage and frequency	refer to 7914R and 7971A
AC power required (standard)	925 Watts max.
(Option 002 or 240)	adds 50 Watts
(Option 114)	adds 700 Watts

7914TD HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7914TD	7914R#140 disc	1	0...7	1	H or N	0.0m	2.0m
	7971A tape	1	0...7	2	High	0.0m	2.0m
Option 002	sep. cntrlr 88140	+1	0...7	+1	H or N	+1.0m	+2.0m
Option 114	2nd 7914R#140 disc	+1	0...7	+1	H or N	-	-
Option 240	single cntrlr 88140	-	-	-	-	-	-

The disc drive is always UNIT 0. The Option 240 cartridge tape drive is UNIT 1. The Option 002 cartridge tape drive is UNIT 0. The 7971A has "unit" addressing, but since is it a master drive, it should be set to UNIT 0.

7914TD/Series 300 Interfacing

Any HP-IB interface is suitable for the disc. despite its designation as a "high" speed device, only the built-in or 98624A HP-IB interfaces are suitable for the 7971A tape. 98620B DMA is required for the 7971A tape and will significantly improve disc performance as well. See 98624A and 98625 for HP-IB cabling rules.

The Option 002 separate controller cartridge tape may be connected to any available HP-IB interface. See "HP-UX Considerations" below for further discussion.

The examples which follow assume a 98625 at select code 14, built-in interface at select code 7 and a 7914TD Option 002 at addresses 0 (disc), 4 (7971) and 2 (88140).

7914TD Switches	Sample Configuration
7914 HP-IB address	0
7971A HP-IB address UNIT	4 0
88140 HP-IB address	2

7914TD/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Drivers required	`cs80, 7970`
Block-mode major number	0 (CS/80)
Character-mode major number	4 (CS/80) 5 (7970)

* 7908/11/12/42/46disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file). Tapes produced by 7914 push-button backup **are not mountable.**

7914TD/Series 300 HP-UX Driver Minor Number

CS/80 Driver (number 0/4)

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex) 7914TD#002	07 to 1F 07 to 1F	00 to 07 00 to 07	0=disc 0=tape	0 0
Values (hex) 7914TD#240	07 to 1F	00 to 07	0=disc 1=tape	0

7970 Driver (number 9)

Bits	23-16	15-8	7-6	5-4	3	2	1	0
Fields	Select Code	HP-IB Address	Tape Density	Unit Number	EOT Semantics	Not Used	EOR/EOF Semantics	Close Semantics
Values (Hex) 7971A	07 to 1F	0 07	00 to	0 to 4	0=Industry 1=HP-UX 2.0	0	0=AT&T 1=Berkeley	0=Rewind 1=NOP

For a 7914TD Option 002, the "Unit Number" field for the cartridge tape drive is zero (at a different HP-IB Address, and possibly a different select code).

Typical *mknod*s for a 7914TD Option 002 (as sole system disc) at select code 14, bus address 0 and cartridge tape at select code 7 bus address 2. The 7971 is on bus 7 at address 4, with "Berkeley" semantics.

```
# mknod /dev/hd    b 0 0x0e0000
# mknod /dev/rhd   c 4 0x0e0000
# mknod /dev/mt    c 5 0x070402
# mknod /dev/ct    b 0 0x070210
# mknod /dev/rct   c 4 0x070210
```

7914TD/Series 300 HP-UX Considerations:

- The 7914 has adequate performance and capacity for multi-user HP-UX.
- Disc I/O can slow to one I/O per second during shared-controller cartridge tape operations (such as backup). For this reason, the separate controller (7914TD Option 002) is recommended. It is also suggested that the cartridge tape drive be placed on a separate bus from the disc. It is possible to convert a 7914TD Option 240 shared-controller disc to separate-controller. Contact your HP Customer Engineer (CE) for details. If you already have a 7914TD with *no* cartridge tape drive, it is more economical to purchase a stand-alone 9144A.

7914TD Ordering Information

7914TD	132.1 Mbyte disc and 7971A tape in upright cabinet (includes 2×2.0m HP-IB cables)
Option 002	Add separate-controller "88140" cartridge tape drive
Option 015	220 Vac 50 Hz operation
Option 114	Add second 7914R#140 disc drive (without tape drive)
Option 240	Add shared-controller "88140" cartridge tape drive
07912-90901	7914/12/14 Disc Drive Owner's manual (one included w/7914)
07912-90902	7914/12/14 Operating and Installation manual (one included w/7914)
07912-90903	7914/12/14 Disc Drive Service manual
07914-90902	7914TD Installation and Service manual (one included w/7914TD)
07970-90885	7970E Operator and Installation manual (one included w/7914TD)
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
92150D	10 600-ft. reels of tape in seals
92150E	10 1200-ft. reels of tape in seals
92150F	10 2400-ft. reels of tape in seals (one reel included w/7914TD)
92150K	Tape labels (box of 1000)
92150L	Color coded tape numbering kit
92150M	BOT/EOT sense markers (card of 250)
92150T	Six-reel media transit case
92193F	Magnetic head cleaning solution
92260T	Tape rack (for 15 ½-in. reels)
92272D	175-reel tape storage cabinet
92272F	300-reel tape library storage rack
9300-0767	Head cleaning swabs (box of 50) (10 included w/7914)

7920M Disc

A 50 Mbyte pack(removable) AMIGO/MAC HP-IB disc drive. New applications should use the more economical (and higher capacity) 7945A or 7912P, unless removability is required, in which case consider the 7935H.

NOTE

This information is provided only for those who already have a 7920 and desire to transfer the data to a supported disc. This information applies *only* to a recent 7920M Option 102 disc (i.e. 7920C/D disc, 13037C/D/U Multi-Access Controller (MAC) and 12745C/D HP-IB adaptor). There is no HP9000 interface for the 13037 controller *without* an HP-IB adaptor. The 7920H ICD disc is known to *not work*. The usability of 7920S (slave) and 7920A/B discs is not known.

7920/Series 300 Support Summary

No 7920 support is planned for any HP9000 computer. Refer to "Interfacing" below. No diagnostic support exists for this disc in any system. The boot ROM code is not guaranteed to work and may be removed from future versions of the ROM.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7920M	50 Mbyte pack disc.	Unsup.	Unsup.	Unsup.	No	Unsup.	No

The HP-UX 5.0 *mediainit* command does not yet support AMIGO discs. This capability is planned for 5.1. In the meantime, you may perform the initialization on most other systems which support AMIGO discs, then create the file system in HP-UX with *mkfs*.

7920 Selected Specifications

Interface and command set	HP-IB, AMIGO/MAC
Formatted capacity	50073600 bytes
Bytes per sector	256
Sectors per track	48
Tracks per surface	815 (plus 8 spare)
Surfaces per drive	5
Format options	None

12745C/D(7920) HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
12745C/D	HP-IB adaptor for MAC discs	1	0...7	1	High	0.9m	2.0m

7920/Series 300 Interfacing

Only the 98625 interface with 98620B DMA is likely to work. The 98625 interface must be set to interrupt level 6.

7920D/12745D Switches	Sample Configuration
Unit	0
Protect	Off
RUN/STOP	RUN
Format	•
CPU number (S1)	0
HP-IB address (S2)	6 (supported disc at 0)

Although the suggested initial use is write enabled, Series 300 HP-UX supports access to write-protected media (except the root disc). The 7920 should be format-protected after *mediainit* and write-protected when copying data to a supported disc.

7920/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

7920/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0	0

Typical *mknod*s for 7920 at select code 14, bus address 6

```
# mknod /dev/hd7920  b  2 0x0e0600
# mknod /dev/rhd7920 c 11 0x0e0600
```

7920/Series 300 HP-UX Considerations:

- HP-UX will "complain" during bootup about the unsupported interrupt level 6 set on the 98625 interface. No supported discs should be connected to the same interface.
- The RUN/STOP switch of the 7920 does not "request release" from the host. You must assume responsibility for dismounting (*umount*) the pack before removing it, or I/O errors and possible file system corruption may occur.

7920/Series 300 Pascal Interfacing

The AMIGO/MAC disc code was removed from the standard CTABLE at Pascal revision 3.0.

7925M Disc

A 120.2 Mbyte pack(removable) AMIGO/MAC HP-IB disc drive. New applications should use the more economical (and higher capacity) 7933H, unless removability is required, in which case consider the 7935H.

NOTE

This information is provided only for those who already have a 7925 and desire to transfer the data to a supported disc. This information applies *only* to a recent 7925M Option 102 disc (i.e. 7925C/D disc, 13037C/D/U Multi-Access Controller (MAC) and 12745C/D HP-IB adaptor). There is no HP9000 interface for the 13037 controller *without* an HP-IB adaptor. The 7925H ICD disc is known to *not work*. The usability of 7925S (slave) and 7925A/B discs is not known.

7925/Series 300 Support Summary

No 7925 support is planned for any HP9000 computer. Refer to "Interfacing" below. No diagnostic support exists for this disc in any system. The boot ROM code is not guaranteed to work and may be removed from future versions of the ROM.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7925M	120 Mbyte pack disc.	Unsup.	Unsup.	Unsup.	No	Unsup.	No

The HP-UX 5.0 *mediainit* command does not yet support AMIGO discs. This capability is planned for 5.1. In the meantime, you may perform the initialization on most other systems which support AMIGO discs, then create the file system in HP-UX with *mkfs*.

7925 Selected Specifications

Interface and command set	HP-IB, AMIGO/MAC
Formatted capacity	120 176 640 bytes
Bytes per sector	256
Sectors per track	64
Tracks per surface	815 (plus 8 spare)
Surfaces per drive	9
Format options	None

12745C/D(7925) HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
12745C/D	HP-IB adaptor for MAC discs	1	0...7	1	High	0.9m	2.0m

7925/Series 300 Interfacing

Only the 98625 interface with 98620B DMA is likely to work. The 98625 interface must be set to interrupt level 6.

7925D/12745D Switches	Sample Configuration
Unit	0
Protect	Off
RUN/STOP	RUN
Format	•
CPU number (S1)	0
HP-IB address (S2)	6 (supported disc at 0)

Although the suggested initial use is write enabled, Series 300 HP-UX supports access to write-protected media (except the root disc). The 7925 should be format-protected after *mediainit* and write-protected when copying data to a supported disc.

7925/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

7925/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0	0

Typical *mknod*s for 7925 at select code 14, bus address 6

```
# mknod /dev/hd7925  b  2 0x0e0600
# mknod /dev/rhd7925 c 11 0x0e0600
```

7925/Series 300 HP-UX Considerations:

- HP-UX will "complain" during bootup about the unsupported interrupt level 6 set on the 98625 interface. No supported discs should be connected to the same interface.
- The RUN/STOP switch of the 7925 does not "request release" from the host. You must assume responsibility for dismounting (*umount*) the pack before removing it, or I/O errors and possible file system corruption may occur.

7925/Series 300 Pascal Interfacing

The AMIGO/MAC disc code was removed from the standard CTABLE at Pascal revision 3.0.

7933/35H Discs

The 7933H and 7935H are high-performance 404 Mbyte CS/80 HP-IB discs. The 7935H has removable media.

7933/35/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7933H	404 Mbyte disc	Rev. A	Yes	Yes	4.0	5.0	3.1
7935H	404 Mbyte disc	Rev. A	Yes	Yes	4.0	5.0	3.1

7933/35 Specification Summary

Data sheets (for complete specifications)	5953-3624, -3634
Dimensions	825mmH, 552mmW, 834mmD
Weight	154 kg (192 kg shipping)
Interface and command set	HP-IB, CS/80
Controller overhead	3.5 ms
Seek time	5 ms track-to-track
	24 ms average
	42 ms full stroke
Average latency	11.1 ms
Transfer rate	1.0 Mbytes/sec. maximum
	983 kbytes/sec. average*
I/Os per second	25
Formatted capacity	404 458 496 bytes
Bytes per sector	256
Sectors per track	92 (plus 1 spare)
Tracks per surface	1321 (plus 6 spare, 12 maint.)
Surfaces per drive	13
Format options	None
AC voltage required	120, 208, 220, 240 ±10%
AC frequency tolerance	47.5 to 63 Hz
AC power required	1300 Watts max.
AC line drop tolerance	one half line cycle

7933/35 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7933H	404 Mbyte disc	1	0...7	1	H or N	0.0m	1.0m
7935H	404 Mbyte disc	1	0...7	1	H or N	0.0m	1.0m

* Continuous disc I/O rate in an operating system is lower.

7933/35/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a 98625 at select code 14 and a 7933H at bus address 0. See 98624A and 98625 for HP-IB cabling rules.

7933/35 Switches	Sample Configuration
Disc HP-IB address	0
LOAD/UNLOAD	LOAD

7933/35/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	`:,1400,0` or `:CS80,1400,0`
Binaries required	CS80 and HPIB or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7933/35 should not be selected for use in a BASIC application unless its high capacity or performance is a requirement. The single LIF directory is very inconvenient when many files are present.

7933/35/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

7933/35/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Not Used	Not Used
Values (hex)	07 to 1F	00 to 07	0	0

Typical *mknod*s for 7933H (as system disc) at select code 14, bus address 0.

```
# mknod /dev/hd   b 0 0x0e0000
# mknod /dev/rhd  c 4 0x0e0000
```

7933/35/Series 300 HP-UX Considerations:

- The 7933/35 has adequate performance and capacity for multi-user HP-UX.
- The LOAD/UNLOAD switch of the 7933/35H requests release from the host. Series 200/300 HP-UX alway grant release unconditionally. It is your responsibility to dismount (*umount*) the disc or shutdown the system before spinning down the drive.

7933/35/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volumes	:11...40 (30 total, disc only) 29 are 13 471 744 bytes; last is 13 777 920 bytes
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7933/35 Ordering Information

7933H	404 Mbyte disc, w/1.0m HP-IB cable, 208 Vac operation
7933G	Three 7933H drives
7935H	404 Mbyte removeable disc, w/1.0m HP-IB cable, 208 Vac operation
7935G	Three 7935H drives
Option 120	120 Vac 50/60 Hz operation
Option 220	220 Vac operation in Canada
Option 221	220 Vac 50/60 Hz operation in Continental Europe
Option 222	220 Vac 50/60 Hz operation in Switzerland
Option 223	220 Vac 50/60 Hz operation in Denmark
Option 241	240 Vac 50/60 Hz operation in the U.K.
Option 242	240 Vac 50/60 Hz operation in New Zealand
07930-90901	7933 Disc Drive Owner's manual (one included w/7933)
07935-90901	7935 Disc Drive Owner's manual (one included w/7935)
07930-90902	7933 Installation manual (one included w/7933)
07935-90902	7935 Installation manual (one included w/7935)
07930-90903	7933/35 Disc Drive Service manual
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
97935A	7935H media module (one included w/7935H)

7941A Disc

The 7941A is a medium-performance 23.8 Mbyte fixed (non-removable) CS/80 HP-IB disc housed in a five-unit high 325mm-wide *Design-Plus* enclosure.

7941A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7941A	23.8 Mbyte disc	Rev. A	Yes	Yes	4.0	5.0	3.1

7941A Specification Summary

Data sheet (for complete specifications)	5953-3666
Dimensions	130mmH, 325mmW, 285mmD
Weight	9.9 kg (12.9 kg shipping)
Interface and command set	HP-IB, CS/80
Controller overhead	10.1 ms
Seek time	5 ms track-to-track 30 ms average 60 ms full stroke
Average latency	8.3 ms
Transfer rate	625 kbytes/sec. average*
I/Os per second	20
Formatted capacity	23 789 568 bytes
Bytes per sector	256
Sectors per track	32
Tracks per surface	968
Surfaces per drive	3
Format options	None
AC voltage required	90 to 132, 180 to 264
AC frequency tolerance	47.5 to 66 Hz
AC power required	65 Watts typical, 85 Watts max.
AC line drop tolerance	one line cycle

7941A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7941A	23.8 Mbyte disc	1	0...7	1	N or H	0.0m	1.0m
Option 055	Delete HP-IB cable	-	-	-	-	-	-1.0m

* Continuous disc I/O rate in an operating system is lower.

7941A/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a built-in HP-IB at select code 7 and a 7941A at bus address 0. See 98624A and 98625 for HP-IB cabling rules.

7941A Switches	Sample Configuration
Disc HP-IB address	0

7941A/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	:,700,0 or :CS80,700,0
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7941A should not be selected for use in a BASIC application unless its high capacity is a requirement. The single LIF directory is very inconvenient when many files are present. A 9154A plus a 9134H SS/80 disc provides 30 Mbytes, addressable as up to 16 LIF directories at slightly lower performance and about the same price.

7941A/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1
Driver required	cs80
Block-mode major number	0
Character-mode major number	4

7941A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0	0

Typical *mknod*s for 7941A (as system disc) at select code at select code 7 bus address 0.

```
# mknod /dev/hd    b 0 0x070000
# mknod /dev/rhd   c 4 0x070000
```

7941A/Series 300 HP-UX Considerations:

- The 7941 has adequate performance for a 2-6-user multi-user HP-UX system, but does not have adequate capacity for some applications, nor for the full system (AXE, Programming Environment and all languages).

7941A/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volumes	:11...33 (23 total, disc only) 22 are 1 032 192 bytes; last is 1 081 344 bytes
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7941A Ordering Information

7941A	23.8 Mbyte disc, w/1.0m HP-IB cable
Option 015	Voltage selector preset to 230 V range
Option 550	Delete HP-IB cable
07940-90901	7940-series Disc Drive Owner's manual (one included w/7941)
07940-90903	7940-series Disc Drive Service manual
19500B	19-in. EIA rack-mount adaptor
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives

7942A Disc/Tape

The 7942A is a medium-performance 23.8 Mbyte fixed (non-removable) CS/80 HP-IB disc with a built-in 9144 shared-controller ¼-in. cartridge tape drive. The 7942A is housed in an eight-unit high 325mm-wide *Design-Plus* enclosure. The 7942A is essentially a 7941A disc and 9144A tape drive in a common package. This section includes only the information unique to the 7942A.

Push-button disc→tape and tape→disc operations are provided. There is no Option to provide a separate-controller tape drive. For this configuration separately order a 7941A disc and 9144A tape drive.

7942A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7942A	23.8 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1

7942A Specification Summary

Data sheet (for complete specifications)	5953-3659
Dimensions Weight	208mmH, 325mmW, 285mmD 15.8 kg (19.6 kg shipping)
Disc drive specifications	refer to 7941A
Tape drive specifications	refer to 9144A
AC requirements AC power required	same as 7941A except... 120 Watts typical, 125 Watts max.

7942A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7942A	23.8 Mbyte disc/tape	1	0...7	1	N or H	0.0m	1.0m
Option 055	Delete HP-IB cable	-	-	-	-	-	-1.0m

The disc is UNIT 0 and the tape drive is UNIT 1.

7942A/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a built-in HP-IB at select code 7 and a 7942A at bus address 0. See 98624A and 98625 for HP-IB cabling rules.

7942A Switches	Sample Configuration
Disc HP-IB address	0

7942A/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	:,700,0 or :CS80,700,0 (disc) :,700,1 or :CS80,700,1 (tape)
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7942A should not be selected for use in a BASIC application unless its medium performance, high capacity or push-button backup are requirements. The single LIF directory is very inconvenient when many files are present. The 9134H can provide 19.9 or 22.3 Mbytes of storage accessed as 1 to 8 separate volumes. Although it is lower in performance than the 7942A, a 9134H plus a 9144A tape is also more economical.

7942A/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	cs80
Block-mode major number	0
Character-mode major number	4

7942A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0 (disc) 1 (tape)	0

Typical *mknod*s for 7942A (as system disc) at select code at select code 7 bus address 0.

```
# mknod /dev/hd    b 0 0x070000
# mknod /dev/rhd   c 4 0x070000
# mknod /dev/ct    b 0 0x070010
# mknod /dev/rct   c 4 0x070010
```

7942A/Series 300 HP-UX Considerations:

- The 7942 has adequate performance for 2-6-user multi-user HP-UX. It does not have adequate capacity for multiple users in typical applications, nor can it hold the entire HP-UX system (AXE, Programming Environment and all languages).
- The shared controller is unavailable for disc I/O for as long as 45 seconds when a tape cartridge is inserted.
- Disc I/O can slow to one I/O per second (or worse) during on-line tape operations. For this reason, the recommended configuration is to use a separate 7941A disc and 9144A tape drive instead of the 7942A.

---

* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file).

7942A/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volumes	:11...40 (23 total, disc only) 22 are 1 032 192 bytes; last is 1 081 344 bytes :41 (tape)
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7942A Ordering Information

7942A	23.8 Mbyte disc/tape, w/1.0m HP-IB cable
Option 015	Voltage selector preset to 230 V range
Option 550	Delete HP-IB cable
07940-90901	7940-series Disc Drive Owner's manual (one included w/7942)
07940-90903	7940-series Disc Drive Service manual
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
92193F	Magnetic head cleaning solution
9300-0767	Head cleaning swabs (box of 50) (10 included w/7912)

7945A Disc

The 7945A is a medium-performance 55.5 Mbyte fixed (non-removable) CS/80 HP-IB disc housed in a five-unit high 325mm-wide *Design-Plus* enclosure.

7945A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7945A	55.5 Mbyte disc	Rev. A	Yes	Yes	4.0	5.0	3.1

7945A Specification Summary

Data sheet (for complete specifications)	5953-3666
Dimensions	130mmH, 325mmW, 285mmD
Weight	9.9 kg (12.9 kg shipping)
Interface and command set	HP-IB, CS/80
Controller overhead	10.1 ms
Seek time	5 ms track-to-track 30 ms average 60 ms full stroke
Average latency	8.3 ms
Transfer rate	625 kbytes/sec. average*
I/Os per second	20
Formatted capacity	55 508 992 bytes
Bytes per sector	256
Sectors per track	32
Tracks per surface	968
Surfaces per drive	7
Format options	None
AC voltage required	90 to 132, 180 to 264
AC frequency tolerance	47.5 to 66 Hz
AC power required	65 Watts typical, 85 Watts max.
AC line drop tolerance	one line cycle

7945A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7945A	55.5 Mbyte disc	1	0...7	1	N or H	0.0m	1.0m
Option 055	Delete HP-IB cable	-	-	-	-	-	-1.0m

* Continuous disc I/O rate in an operating system is lower.

7945A/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a built-in HP-IB at select code 7 and a 7945A at bus address 0. See 98624A and 98625 for HP-IB cabling rules.

7945A Switches	Sample Configuration
Disc HP-IB address	0

7945A/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	`:,700,0` or `:CS80,700,0`
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7945A should not be selected for use in a BASIC application unless its high capacity is a requirement. The single LIF directory is very inconvenient when many files are present. Any of several SS/80 discs can be combined at a similar price to provide similar capacities and up to 8 LIF directories/drive on separately addressable volumes.

7945A/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

7945/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0	0

Typical *mknod*s for 7945A (as system disc) at select code at select code 7 bus address 0.

```
# mknod /dev/hd    b 0 0x070000
# mknod /dev/rhd   c 4 0x070000
```

7945A/Series 300 HP-UX Considerations:

- The 7945 has adequate performance and capacity for 2-6-user multi-user HP-UX.

7945A/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volumes	:11...40 (30 total, disc only) 29 are 1 843 200 bytes; last is 2 056 192 bytes
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7945A Ordering Information

7945A	55.5 Mbyte disc, w/1.0m HP-IB cable
Option 015	Voltage selector preset to 230 V range
Option 550	Delete HP-IB cable
07940-90901	7940-series Disc Drive Owner's manual (one included w/7945)
07940-90903	7940-series Disc Drive Service manual
19500B	19-in. EIA rack-mount adaptor
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives

7946A Disc/Tape

The 7946A is a medium-performance 55.5 Mbyte fixed (non-removable) CS/80 HP-IB disc with a built-in 9144 shared-controller ¼-in. cartridge tape drive. The 7946A is housed in an eight-unit high 325mm-wide *Design-Plus* enclosure. The 7946A is essentially a 7945A disc and 9144A tape drive in a common package. This section includes only the information unique to the 7946A.

Push-button disc→tape and tape→disc operations are provided. There is no Option to provide a separate-controller tape drive. For this configuration separately order a 7945A disc and 9144A tape drive.

7946A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7946A	55.5 Mbyte disc/tape	Rev. A	Yes	Yes	4.0	5.0	3.1

7946A Specification Summary

Data sheet (for complete specifications)	5953-3659
Dimensions Weight	208mmH, 325mmW, 285mmD 15.8 kg (19.6 kg shipping)
Disc drive specifications	refer to 7945A
Tape drive specifications	refer to 9144A
AC requirements AC power required	same as 7945A except... 120 Watts typical, 125 Watts max.

7946A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7946A	55.5 Mbyte disc/tape	1	0...7	1	N or H	0.0m	1.0m
Option 055	Delete HP-IB cable	-	-	-	-	-	-1.0m

The disc is UNIT 0 and the tape drive is UNIT 1.

7946A/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA will provide significant disc performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a built-in HP-IB at select code 7 and a 7946A at bus address 0. See 98624A and 98625 for HP-IB cabling rules.

7946A Switches	Sample Configuration
Disc HP-IB address	0

7946A/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	:,700,0 or :CS80,700,0 (disc) :,700,1 or :CS80,700,1 (tape)
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The 7946A should not be selected for use in a BASIC application unless its high capacity or push-button backup is a requirement. The single LIF directory is very inconvenient when many files are present. Any of several SS/80 discs can be combined at a similar price to provide similar capacities and up to 8 LIF directories/drive on separately addressable volumes.

7946A/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	cs80
Block-mode major number	0
Character-mode major number	4

7946A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0 (disc) 1 (tape)	0

Typical *mknod*s for 7946A (as system disc) at select code at select code 7 bus address 0.

```
# mknod /dev/hd    b 0 0x070000
# mknod /dev/rhd   c 4 0x070000
# mknod /dev/ct    b 0 0x070010
# mknod /dev/rct   c 4 0x070010
```

7946A/Series 300 HP-UX Considerations:

- The 7946 has adequate performance and capacity for 2-6-user multi-user HP-UX.
- The shared controller is unavailable for disc I/O for as long as 45 seconds when a tape cartridge is inserted.
- Disc I/O can slow to one I/O per second (or worse) during on-line tape operations. For this reason, the recommended configuration is to use a separate 7945A disc and 9144A tape drive instead of the 7946A.

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* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file).

7946A/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volumes	:11...40 (30 total, disc only) 29 are 1 843 200 bytes; last is 2 056 192 bytes :41 (tape)
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 to 30

7946A Ordering Information

7946A	55.5 Mbyte disc/tape, w/1.0m HP-IB cable
Option 015	Voltage selector preset to 230 V range
Option 550	Delete HP-IB cable
07940-90901	7940-series Disc Drive Owner's manual (one included w/7946)
07940-90903	7940-series Disc Drive Service manual
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
92193F	Magnetic head cleaning solution
9300-0767	Head cleaning swabs (box of 50) (10 included w/7912)

7970 Tape Drives

No 7970 tape drives are supported on HP 9000 systems, although it is possible to convert some 7970E drives to a supported 7971A configuration. Here is a summary of the situation:

- 7970A/B/C - requires a unique 16-bit interface, cable and driver. None is available on any HP 9000 system and it is unlikely that any GPIO interface is compatible.
- 7970E - Any 45 ips HP-IB master drive with current interface electronics is supportable if mounted in a 26078A cabinet (available for this purpose). This combination *is* a 7971A. Older 7970E's and those without HP-IB interfacing may be upgraded to a current HP-IB master configuration with a 26072A kit.
- If you have a 7970E and prefer to upgrade to a newer drive, trade-in credits are available. You can trade in one 7970E ("ordered" as a 7970EN) for a 7974A, or you can trade in one or two 7970ENs for a 7978A.

7971A Tape Drive

The 7971A is a 45 ips ½-in 9-track open-reel tape drive supplied in an upright cabinet. It supports only 1600 cpi Phase Encoded (PE) format and only in start/stop mode of operation. New applications should specify the 7974A (which also operates in streaming mode and offers optional 800 cpi NRZI format). 7971A Options 840 and 844 are scheduled for obsolesence in late 1986.

A 2400-ft. reel of 1600 cpi tape can store a maximum of 42.9 Mbytes, assuming one file of 16384-byte records and no media defects.

7971A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7971A	1600 cpi tape drive						
Option 840	Single HP-IB master	NOP	Planned	Planned	No	5.0	No
Option 844	Dual HP-IB master	NOP	Planned	Planned	No	5.0	No

Any HP-IB master configuration is supported (there are numerous other Options for HP 1000 and HP 3000 systems). Slave drives may work, but have not been tested. There is no BASIC or Pascal driver support for the 7971A, and none is planned.

7971A Specification Summary

Data sheet (for complete specifications)	5953-6827
Dimensions	158.5cmH, 62.3cmW, 90.5cmD
Weight (single)	195 kg
(dual)	254 kg
Interface and command set	HP-IB, 7970E
Tape format	1600 cpi Phase Encoded (PE)
Read/Write tape speed	45 in./sec. (ips)
Rewind speed	160 ips
Burst transfer rate	72 Kbytes/sec.
Data buffer	32 bytes
Maximum record length	32768 bytes read 16384 bytes write
Media required	10-in. reel (max.), ANSI X3.40-1976, 1.5 mil (1.0 mil not recommended)
AC voltage required	115 or 230 Vac ±10%
AC line frequency tolerance	48 to 66 Hz
AC power required (single)	400 Watts max.
(dual)	800 Watts max.

7971A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7971A	1600 cpi tape drive						
Option 840	single master	1	0...7	2	High	0.0m	6.0m
Option 844	dual master	+1	0...7	+2	High	0.0m	+6.0m

Each drive has "unit" addressing, but since they are master drives, they should be set to UNIT 0.

7971A/Series 300 Interfacing

Despite the "high" speed rate mode, only the built-in or 98624A interface are supported. DMA is required. See 98624 for HP-IB cabling rules. The examples which follow assume a built-in interface at select code 7 and a 7971A Option 840 at address 2.

7971A Switches	Sample Configuration
HP-IB address	2
UNIT	0

7971A/Series 300 HP-UX Interfacing

Mountable volumes per drive	0
Drivers required	7970
Block-mode major number	None
Character-mode major number	5 (7970)

7971A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-6	5-4	3	2	1	0
Fields	Select Code	HP-IB Address	Tape Density	Unit Number	EOT Semantics	Not Used	EOR/EOF Semantics	Close Semantics
Values (Hex) 7971A	07 to 1F	00 to 07	0	0 to 4	0=Industry 1=HP-UX 2.0	0	0=AT&T 1=Berkeley	0=Rewind 1=NOP

Typical *mknod*s for 7971A at select code 7, bus address 7 with "Berkeley" and "no rewind" semantics.

```
# mknod /dev/mt    c 5 0x070203
```

7971A Ordering Information

7971A	1600 cpi tape drive in upright cabinet
Option 015	230 Vac 50/60 Hz operation
Option 840	Single HP-IB master drive
Option 844	Dual HP-IB master drives
7970E	Add-on drive for existing single-drive 7971A
Option 836	Single HP-IB master drive
26074A	Installation kit for 26078A cabinet
07970-90885	7970E Operator and Installation manual (one included w/7971A)
92150D	10 600-ft. reels of tape in seals
92150E	10 1200-ft. reels of tape in seals
92150F	10 2400-ft. reels of tape in seals (one reel included w/7971A)
92150K	Tape labels (box of 1000)
92150L	Color coded tape numbering kit
92150M	BOT/EOT sense markers (card of 250)
92150T	Six-reel media transit case
92193F	Magnetic head cleaning solution
92260T	Tape rack (for 15 ½-in. reels)
92272D	175-reel tape storage cabinet
92272F	300-reel tape library storage rack
9300-0767	Head cleaning swabs (box of 50) (10 included w/7971)

7974A Tape Drive

The 7974A is a 100/50 ips ½-in 9-track open-reel HP-IB tape drive supplied in an upright cabinet. It supports 1600 cpi Phase Encoded (PE) format and optionally 800 cpi NRZI format. The 7974A operates in either start/stop (50 ips) or streaming (100 ips) mode depending on whether data is available on the bus.

The 7974A is ideal for data interchange with other 800 and 1600 cpi systems. It is the only 800 cpi tape drive supported on HP 9000 systems. The 9144A or 7978A are better choices for backup devices, since a 2400-ft. reel of 1600 cpi tape can store a maximum of 42.9 Mbytes, assuming one file of 16 384-byte records and no media defects.

7974A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7974A	1600 cpi tape drive	NOP	Planned	Planned	No	5.0	No*
Option 800	add 800 cpi NRZI	NOP	Planned	Planned	No	5.0	No*

7974A Specification Summary

Data sheet (for complete specifications)	5953-6831
Dimensions	160cmH, 60cmW, 77.5cmD
Weight	180 kg
Interface and command set	HP-IB, 7974
Tape format (standard)	1600 cpi Phase Encoded (PE)
(Option 800)	800 cpi Non-Return-to-Zero-Inverted (NRZI)
Read/Write tape speed	50 in./sec. start/stop
	100 ips streaming
Rewind speed	200 ips
Burst transfer rate	160 Kbytes/sec.
Data buffer	32 Kbytes
Maximum record lengths	16 384 bytes write
	32 768 bytes read
Media required	10-in. reel (max.), ANSI X3.40-1976
	1.5 mil minimum thickness (i.e. 3600-ft. not supported)
AC voltage required	90 to 125, 198 to 250 Vac
	depending on destination
AC line frequency tolerance	48 to 66 Hz
AC power required	520 Watts max.
AC line loss tolerance	20ms in 10 cycles

* A Pascal-based file-transfer utility program for the 7974A is part of the 98305A HP EGS software. It is not separately available.

7974A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7974A	1600 cpi tape drive	1	0...7	1	H or N	1.0m	6.0m

Option 800 does not affect HP-IB characteristics.

7974A/Series 300 Interfacing

The 7974A will function on any HP-IB interface. 98620B DMA is strongly suggested for adequate 7974A performance.

The 7974A tape should be connected to the 98625 interface or the built-in interface, even if that interface is also used for the system disc. The 7974 uses a very efficient command set and (when in use) will not degrade disc performance by more than 10%.

The use of Immediate Report mode is recommended. In this mode, the 7974 reports status immediately upon receipt of write data, rather than after actually writing it to tape. This allows the host to continue gathering data to write, while the tape drive is writing the prior data.

The examples which follow assume a 98625 at select code 14 and a 7974A Option 800 at address 4.

7974A Switches	Sample Configuration
HP-IB address	4

7974A/Series 300 HP-UX Interfacing

Mountable volumes per drive	0
Drivers required	7974
Block-mode major number	None
Character-mode major number	9

7974A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-6	5-4	3	2	1	0
Fields	Select Code	HP-IB Address	Tape Density	Not Used	EOT Semantics	Immediate Report	EOR/EOF Semantics	Close Semantics
Values (Hex)	07 to 1F	00 to 07	00= 800 01=1600	0	0=Industry 1=HP-UX 2.0	0=Enabled 1=Disabled	0=AT&T 1=Berkeley	0=Rewind 1=NOP

Typical *mknod*s for 7974A at select code 14, bus address 4 with "Berkeley" semantics.

```
# mknod /dev/mt      c 9 0x0e0442
# mknod /dev/mt800   c 9 0x0e0402
```

7974A/Series 300 HP-UX Considerations:

- The "immediate report" (IR) mode is more likely to keep the drive "streaming". Without DMA, HP-UX may not be able to keep the drive streaming. However, even with DMA and the 98625 interface, the rate at which you can write data to the tape is typically limited by the rate at which you can collect/create the data. For example, the standard backup utilities *cpio* and *tar* cannot locate and read disc files fast enough to keep the 7974 streaming. With IR on, the system generally is never waiting on the tape drive, even though the drive may be alternating between streaming and start/stop modes due data availability.

7974/Series 300 Pascal Interfacing

The utility program supplied with 98305A HP EGS requires that the 7974A be connected to a 98625 interface and that a 98620 DMA card be present.

7974A Ordering Information

7974A Option 800	1600 cpi tape drive in upright cabinet add 800 cpi NRZI
07974-90000	7974A Operator's manual (one included w/7974A)
88700A	800 cpi NRZI field upgrade kit
92150D	10 600-ft. reels of tape in seals
92150E	10 1200-ft. reels of tape in seals
92150F	10 2400-ft. reels of tape in seals (one reel included w/7974A)
92150K	Tape labels (box of 1000)
92150L	Color coded tape numbering kit
92150M	BOT/EOT sense markers (card of 250)
92150T	Six-reel media transit case
92193F	Magnetic head cleaning solution
92260T	Tape rack (for 15 ½-in. reels)
92272D	175-reel tape storage cabinet
92272F	300-reel tape library storage rack
9300-0767	Head cleaning swabs (box of 50) (10 included w/7974)

7976A Tape Drive

The 7976A is a 6250 cpi GCR and 1600 cpi PE tape drive. It is no longer supplied, having been replaced by the more economical 7978A. Although interfaced via HP-IB, the 7976A has a unique command set for which no driver was ever available on HP9000 computers. For new applications the 7978A (also 6250/1600) is supported.

7978A Tape Drive

The 7978A is a 75 ips ½-in 9-track open-reel HP-IB tape drive supplied in an upright cabinet. It supports both 6250 cpi Group Code Recording (GCR) and 1600 cpi Phase Encoded (PE) formats. The 7978 operates only in streaming mode.

The 7978 is well suited to data logging or applications which require high-density ½-in. tape storage (approx. 140 Mbytes per reel).

7978A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
7978A	6250/1600 cpi tape drive	NOP	Yes	Yes	No	5.0	No

7978A Specification Summary

Data sheet (for complete specifications)	5953-6831
Dimensions	160cmH, 60cmW, 78cmD
Weight	188 kg
Interface and command set	HP-IB, 7978
Tape format (standard)	1600 cpi Phase Encoded (PE)
(Option 800)	800 cpi Non-Return-to-Zero-Inverted (NRZI)
Read/Write tape speed	75 ips
Rewind speed	250 ips
Burst transfer rate	468 Kbytes/sec.
Data buffer	32 Kbytes
Maximum record lengths	16384 bytes read or write
Media required	10-in. reel (max.), ANSI X3.40-1976 1.5 mil minimum thickness (i.e. 3600-ft. not supported)
AC voltage required	90 to 125, 198 to 250 Vac depending on destination
AC line frequency tolerance	48 to 66 Hz
AC power required	300 VA typ., 1020 VA max.
AC dropout tolerance	20 ms in 10 line cycles

7978A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
7978A	1600 cpi tape drive	1	0...7	1	H or N	1.0m	6.0m

7978A/Series 300 Interfacing

The 7978A will function on any HP-IB interface. 98620B DMA is strongly suggested for adequate 7978A performance.

The 7978A tape should be connected to the 98625 interface or the built-in interface, even if that interface is also used for the system disc. The 7978 uses a very efficient command set and (when in use) will not degrade disc performance by more than 10%.

The use of Immediate Report mode is recommended. In this mode, the 7978 reports status immediately upon receipt of write data, rather than after actually writing it to tape. This allows the host to continue gathering data to write, while the tape drive is writing the prior data.

The examples which follow assume a 98625 at select code 14 and a 7978A at address 4.

7978A Switches	Sample Configuration
HP-IB address	4

7978A/Series 300 HP-UX Interfacing

Mountable volumes per drive	0
Driver required	7974
Block-mode major number	None
Character-mode major number	9

7978A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-6	5-4	3	2	1	0
Fields	Select Code	HP-IB Address	Tape Density	Not Used	EOT Semantics	Immediate Report	EOR/EOF Semantics	Close Semantics
Values (Hex)	07 to 1F	00 to 07	01=1600 10=6250	0	0=Industry 1=HP-UX 2.0	0=Enabled 1=Disabled	0=AT&T 1=Berkeley	0=Rewind 1=NOP

Typical *mknod*s for 7978A at select code 14, bus address 4 with "Berkeley" semantics.

```
# mknod /dev/mt       c 9 0x0e0442
# mknod /dev/mt6250   c 9 0x0e0482
```

7978A/Series 300 HP-UX Considerations:

- The "immediate report" (IR) mode is more likely to keep the drive "streaming". Without DMA, HP-UX will not be able to keep the drive streaming. However, even with DMA and the 98625 interface, the rate at which you can write data to the tape is typically limited by the rate at which you can collect/create the data. For example, the standard backup utilities *cpio* and *tar* cannot locate and read disc files fast enough to keep the 7978 streaming. With IR on, the system generally is less often waiting on the tape drive, even though the drive may be experiencing repositioning cycles due to data availability.

7978A Ordering Information

7978A	1600 cpi tape drive in upright cabinet
Option 670	trade-in credit for 7970B or 7970E tape drive
7970EN	Additional trade-in credit for 7970E only.
07978-90000	7978A Operator's manual (one included w/7978A)
92150D	10 600-ft. reels of tape in seals
92150E	10 1200-ft. reels of tape in seals
92150F	10 2400-ft. reels of tape in seals (one reel included w/7978A)
92150K	Tape labels (box of 1000)
92150L	Color coded tape numbering kit
92150M	BOT/EOT sense markers (card of 250)
92150T	Six-reel media transit case
92193F	Magnetic head cleaning solution
92260T	Tape rack (for 15 ½-in. reels)
92272D	175-reel tape storage cabinet
92272F	300-reel tape library storage rack
9300-0767	Head cleaning swabs (box of 50) (10 included w/7978)

82169A HP-IB/HP-IL Interface

The 82169A is an HP-IB (IEEE 488-1978) to Hewlett-Packard Interface Loop converter. It provides HP-IL capability to HP 9000 computers (which do not offer a dedicated HP-IL interface). Note that no HP-IL-specific documentation (apart from these pages) is provided with any HP 9000 system. HP-IB/HP-IL translation is described in the 82169A Owner's Manual.

The 82169A can act as an addressed HP-IB device ("mailbox" mode) or as a transparent converter ("translate" mode).

HP-IL is electrically and mechanically different from HP-HIL.

82169A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
82169A	HP-IL/HP-IB converter	No	Planned	Planned	Unsup.	Unsup.	Unsup.

Mass storage devices (such as the 9114A disc) on the HP-IL side of the connection may cause error messages during boot. Successful boot from an HP-IL mass storage device is unlikely. Such devices should be powered off during boot.

82169A Specification Summary

Data sheet (for complete specifications)	5953-5547
Dimensions Weight	28mmH, 119mmW, 160mmD .278 kg
Interface Transfer rate HP-IB → HP-IL HP-IL → HP-IB HP-IB buffer size HP-IB buffer load rate	HP-IB and HP-IL 3.0 Kbytes/sec. max. 1.8 Kbytes/sec. max. 110 bytes 6.0 Kbytes/sec. max.
AC voltage required AC power required	Via localized 8.5 Vac adaptor 82059D is 90 to 120 Vac, 50/60 Hz 0.68 VA typ., 1.11 VA max.

82169A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
82169A	HP-IB/HP-IL converter	1	0 to 30	1	Normal	0.0m	HP-IL

The 82169A does not include an HP-IB cable.

82169A/Series 300 Interfacing

82169A Switches	Suggested Initial Configuration
HP-IB address	8
Mode	Translate

- The 82169A may be compatible with built-in or 98624A HP-IB interfaces. It is unlikely to be compatible with the 98625 interface.

- All HP-IB and HP-IL addresses must be unique. In translate mode the 82169A assigns auto-addresses to the HP-IL devices starting with the first address after its own HP-IB address (starting with 9 in the above example).
- The 82169A cannot return a Parallel Poll (PPOLL) response from an HP-IL device within the 25μsec timeout used by Series 300 HP-IB interfaces.

82169A Ordering Information

82169A Option XEU Option XUK	HP-IL/HP-IB Interface (U.S./Canadian AC adaptor) European AC adaptor (English documentation) U.K. AC adaptor
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable
82059D	AC transformer (one included w/82169A)
82167A	0.5m HP-IL cable (one included w/82169A)
82167B	1.0m HP-IL cable (one included w/82169A)
82167D	5.0m HP-IL cable (one included w/82169A)
82169-90001	User Manual (full-size, one included w/82169A)
92233A	The HP-IL System: An Introductory Guide

82901/02M/S Flexible Discs

The 82901/02 are 270 Kbyte 5¼-in. double-sided flexible disc drives. The master drives are HP-IB interfaced and use the AMIGO command set. They are no longer supplied, having been replaced by the 9125S. The various versions are:

82901M - dual master drive.

82901S - dual slave drive. The 82901S must be connected by a dedicated cable (not HP-IB) to an 82901M or 82902M. Late production 82901/02M drives did not have the "slave" connector.

82902M - single master drive.

82902S - single slave drive. The 82902S must be connected by a dedicated cable (not HP-IB) to an 82901M or 82902M. Late production 82901/02M drives did not have the "slave" connector.

82901/02-Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
82901M	Dual master flex disc	Rev. A	Inves.	Inves.	4.0	5.1	3.1
82901S	Dual slave flex disc	Unsup.	Inves.	Inves.	Unsup.	Unsup.	Unsup.
82902M	Single master flex disc	Rev. A	Inves.	Inves.	4.0	5.1	3.1
82902S	Single slave flex disc	Unsup.	Inves.	Inves.	Unsup.	Unsup.	Unsup.

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC, Pascal).

82901/02 Selected Specifications

Interface and command set	HP-IB, AMIGO
Seek time	5 ms track-to-track 187 ms average
Average latency	100 ms
Transfer rate	6.8 Kbytes/sec.
I/Os per second	4
Formatted capacity	270336 (per flex. medium)
Bytes per sector	256
Sectors per track	16
Tracks per surface	33 (plus spares)
Surfaces per drive	4 (82901), 2 (82902)
Format options	None
Media	92190A (box of 10)

82901/02 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
82901M	Dual master flex. disc	1	0...7	1	Normal	0.0m	None
82902M	Single master flex. disc	1	0...7	1	Normal	0.0m	None

Master "drive 0" and "drive 1" are UNIT 0 and UNIT 1, respectively. Slave "drive 0" and "drive 1" are UNIT 2 and UNIT 3 regardless of whether the master disc has one or two drives.

82901/02-Series 300 Interfacing

Only the built-in and 98624 interfaces are suitable. Errors will occur if you use the 98625. 98620 DMA will not provide significant performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 82901M at bus address 2. See 98624A for HP-IB cabling rules.

82901 Switches	Sample Configuration
HP-IB address	2

82901/02M Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620B DMA	4	4	NA
With 98620B DMA	4	4	NA

82901/02-Series 300 BASIC Interfacing

Typical *msus*	:,702,0 or :HP8290X,702,0 (drive 0) :,702,0 or :HP8290X,702,1 (drive 1)
Binaries required	HPIB and DISC
Binaries optional	MS, TRANS
LIF Directories per drive	1 or 2

82901/02-Series 300 HP-UX Interfacing

Mountable volumes per drive	1 or 2
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

82901/02/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=master 0 1=master 1 2=slave 0 3=slave 1	0

Typical *mknod*s for 82901M at select code 7, bus address 2

```
# mknod /dev/fd.0   b  2 0x070200
# mknod /dev/rfd.0  c 11 0x070200
# mknod /dev/fd.1   b  2 0x070210
# mknod /dev/rfd.1  c 11 0x070210
```

82901/Series 300 HP-UX Considerations:
The 82901/02 do not have "media change detect". In addition to the normal cautions about unmounting *(umount)* media before removing it from the drive, there is risk of corrupting *two* discs if you insert a second disc without having dismounted the first.

82901/02-Series 300 Pascal Interfacing

Media specifier letter	`N`
Default volumes	:3 and 4 (if first/sole disc) :7 and 8 (if second flexible disc)
Modules required	DISCHPIB, AMIGO, and DMA (if using 98620 DMA)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 or 2

82905A/B Printers

The 82905A/B are 60 cps dot-matrix impact printers for 8½-in. wide paper. Both are available with a variety of interfaces. This section discusses only the HP-IB versions. The two models are:

82905A - This version is essentially identical to the Epson MX-80 Type II printer (i.e. its command set is *not* HP PCL). The character set is ASCII only. The 82905A is no longer supplied.

82905B - This version has a command set similar to HP PCL level 1. A major exception is the non-standard raster graphics printing. The character set is HP Roman Extension. The 82905B will no longer be supplied after Nov. 1, 1985.

For new applications, the 2225A *ThinkJet* is faster, quieter, more economical and supports HP raster graphics. If impact printing is required, choose the 82906A (same price as 82905B).

82905/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
82905A Opts. 002-004	60 cps printer HP-IB interface	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
82905B Opts. 002-004	60 cps printer HP-IB interface	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
82905A	Printer, HP-IB	No	No	No	No
82905B	Printer, HP-IB	Utility, unsup.	No	No	Utility, unsup.

82905 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
82905A/B Opts. 002-004	60 cps printer HP-IB interface	1	0...30	1	Normal	0.0m	None

82905/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 82905A/B.

82905A/B Switches	Sample Configuration
HP-IB address	1

82905/Series 300 BASIC Interfacing

Typical device specifier	701
Binaries required	HP-IB
Binaries optional	IO
Programming required	PRINTER IS 701
DUMP GRAPHICS supported	No

82905/Series 300 HP-UX Interfacing

Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	`dumb` (alpha only)
DGL/*starbase* handler	None

82905/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3**	**2**	**1**	**0**
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case Fold	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	1=Upper	1="NOCR"	1=RAW

Typical *mknod*s for 82905B at select code 7, bus address 1

```
# mknod /dev/lp  b 7 0x070100
# mknod /dev/rlp b 7 0x070101
```

82905/Series 300 HP-UX Considerations:

- The 82905 has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 82905. If you have a built-in and a 98624A interface, use the 98624A for the 82905. If possible, a dedicated 98624A is suggested.
- The 82905A/B cannot print graphics raster data supplied by the *dump_graphics.c* command. It may be possible to modify the command (supplied in source form).

82905/Series 300 Pascal Interfacing

Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump supported	No

82906A Printer

A 160 cps dot-matrix HP-IB impact printer for 8½-in. wide paper. The 2225A *ThinkJet* is a better choice unless impact printing is required. Although rated at 150 cps, the 2225A is actually faster than the 82906A due to a higher paper slewing speed.

82906A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
82906A	160 cps printer	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
82906A	160 cps printer	Raster Dump	No	Raster Dump	Raster Dump

82906A Specification Summary

Data sheet (for complete specifications)	5953-6285
Dimensions	100mmH, 420mmW, 347mmD
Weight	7.5 kg
Interface and command set	HP-IB, PCL-1
Paper width (min., max.)	9.5-in (242mm), 10-in (254mm)
Print speed	160 cps, bidirectional, optimized path
Character cell	9×9
Print pitches (cpi)	5.0, 6.0, 8.5, 10.0, 12.0 and 17.0
Length lengths (respectively)	40, 48, 68, 80, 80, 96, 137
Line spacing (lpi)	6, 8, 9, 12
Character set	HP ROMAN8
Graphics density (dpi)	72×72
AC voltage required	100, 120, 220, 240
AC frequency tolerance	50/60 Hz
AC power required (idle, max.)	70 Watts

82906A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
82906A	160 cps printer	1	0...30	1	Normal	0.0m	None

82906A/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 82906A.

82906A Switches	Sample Configuration
HP-IB address	1

82906A/Series 300 BASIC Interfacing

Typical device specifier	`701`
Binaries required	HP-IB
Binaries optional	IO
Programming required	`PRINTER IS 701`
DUMP GRAPHICS supported	Yes

82906A/Series 300 HP-UX Interfacing

Drivers required	`printer`
Block-mode major number	NA
Character-mode major number	7
Spooler model file	Use: `2631g`
DGL/*Starbase* handler	None

82906A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3**	**2**	**1**	**0**
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case Fold	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	1=Upper	1="NOCR"	1=RAW

Typical *mknod*s for 82906A at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

82906A/Series 300 HP-UX Considerations:

- The 82906A has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 82906A. If you have a built-in and a 98624A interface, use the 98624A for the 82906A. If possible, a dedicated 98624A is suggested.
- The 82906A can print graphics raster data supplied by the *dump_graphics.c* command.

82906A/Series 300 Pascal Interfacing

Default volume	`PRINTER:` or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump supported	Yes

82906A Ordering Information

82906A	160 cps Printer
Option 001	100 Vac operation (Japan only)
Option 002	120 Vac operation
Option 003	220 Vac operation
Option 004	240 Vac operation
82906-90002	Owner's Manual (one included w/82906)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
82906A+49A-00	Self-paced service training for 82906
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable
92154N	Print head (one included w/82906)
92156A	Printer ribbons, box of 3 (one ribbon included w/82906)
92157B	Box of 3200 sheets, fan-fold perf-margin paper, 3-hole punched
92171N	Tractor unit (for fan-fold media narrower than 9.5-in.)
92261S	Acrylic printer stand

82912/13A Video Monitors

The 82912A and 82913A are 9- and 12-in. (respectively) monochrome (green) CRT displays. They are interfaced only via the 98204A video interface on HP 9000 computers.

82912/13A-Series 300 Support Summary

These monitors require the 98204A card set, which is not supported in Series 300 computers.

88140 Cartridge Tape Drive

"88140" is the HP 9000 nomenclature for the CS/80 ¼-in. streaming* cartridge tape drive built-in to the 7908P/R, 7911P/R, 7912P/R, 7914P/R, 7914ST Option 002/240 and 7914TD Option 002/240 disc/tape drives. The 88140 is not available as a product§. The 88140 is often referred to by its code name: "Linus".

The other ¼-in. cartridge tape drive supported by HP 9000 systems is the 9144. Tapes are fully interchangable between 88140 and 9144 drives. The major differences between the 88140 drive and the 9144 drive are:

- the 9144 has read-after-write, which eliminates a separate verification operation when writing tapes;
- the 9144 has "immediate report" mode (presently supported only by Series 200/300 HP-UX), which assists in keeping the 9144 streaming.

The discs which include an 88140 offer either shared-controller operation (standard or Option 240) or separate-controller operation (Option 001 or 002). Shared-controller supports push-button disc→tape and tape→disc copy. Separate-controller operation has less adverse impact on multi-tasking systems (such as HP-UX) during tape operations.

¼-in. cartridges tapes are accessed more like discs than conventional (9-track) tapes. It is possible to seek to and re-write individual 1024-byte blocks. In an emergency, a disc-image tape can be mounted in HP 9000 operating systems and treated as a (very slow) file system.

The 88140 (and 9144) drives use either 88140SC (150-ft. 16 Mbyte) or 88140LC (600-ft. 67 Mbyte) tapes. These tapes are pre-formatted and pre-certified (i.e. have bad blocks spared). The older 88140S and 88140L tapes were not pre-certified. Due to minor alignment differences between drives, it is always a good idea to re-certify (initiallize) a tape for use on a given drive.

The industry designation for these tapes is DC600 and DC615 (although HP only supports HP media). DC300 and HP 92242L/S tapes are not pre-formatted and do not work. De-gaussed tapes are unusable.

88140/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
88140	Shared-controller tape	Rev. A	Yes	Yes	4.0	5.0	3.1
88140	Separate-controller tape	Rev. A	Yes	Yes	4.0	5.0	3.1

* The 88140 drives provide best performance when the system reads or writes with no delay between records or uses large records (≥10 Kbytes). Short records with pauses between them causes poor performance and excess drive wear.

§ If you have one of these discs without an 88140 tape, it is possible to order components to upgrade it to tape capability. Contact your HP Customer Engineer for details.

88140 Specification Summary

Data sheet (for complete specifications)	5953-3632
Dimensions	refer to host disc
Weight	refer to host disc
Interface and command set	HP-IB, CS/80
Read/write speed	60 ips
Search speed	90 ips
Density	10000 cpi
Tracks	16
Data transfer rate	35 Kbytes/sec. average
Read-while-write	No
Immediate report	No
Formatted capacity	16744448 bytes (88140SC tape) 66977200 bytes (88140LC tape)
Bytes per block	1024
Blocks per tape	16352 (88140SC), plus 32 spare 240 maint. 65408 (88140LC) plus 128 spare 240 maint.
Format options	None
AC requirements	refer to host disc

88140 HP-IB Characteristics

Note - This information duplicates that provided for the host disc.

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
88140	Cartridge tape drive	0 or 1	0...7	0 or 1	H or N	see host	see host

The 88140 is UNIT 1 in a shared-controller configuration (at the host disc's bus address). The 88140 is UNIT 0 in a separate-controller configuration (at its own bus address).

88140/Series 300 Interfacing

Any HP-IB interface is suitable. 98620B DMA will provide some performance improvement and a 98625 or Series 300 built-in HP-IB will provide less overhead per transaction than a 98624A interface. The examples which follow assume a built-in HP-IB at select code 7 and a separate-controller 88140 at bus addresses 2. See 98624A and 98625 for HP-IB cabling rules.

88140 Switches	Sample Configuration
Disc HP-IB address	0
Tape HP-IB address (shared-controller only)	2

88140/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	:,702,0 or :CS80,702,0 (tape)
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The BASIC tape copy utilities perform a disc-image backup only to a shared-controller disc/tape. Use the COPY command (volume or file) for separate-controller disc/tapes.

88140/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	cs80
Block-mode major number	0
Character-mode major number	4

88140/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=sep. tape 1= shared tape	0

Typical *mknod*s for 7912P Option 001 (w/separate-controller 88140) as system disc at select code 14, bus address 0 and tape at select code 7 bus address 2.

```
# mknod /dev/hd    b 0 0x0e0000
# mknod /dev/rhd   c 4 0x0e0000
# mknod /dev/ct    b 0 0x070210
# mknod /dev/rct   c 4 0x070210
```

88140/Series 300 HP-UX Considerations:

- Disc I/O can slow to 1 I/O per second during tape operations (such as backup). For this reason, the separate controller (disc Option 001 or 002) is recommended. It is also suggested that the tape drive be placed on a separate bus from the disc.

---

* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency procedure (e.g. recovery of purged file). Tapes produced by 7914 push-button backup **are not mountable**.

88140/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	Q
Default volume	:41
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 (to 30, if disc-image)

The Pascal tape copy utilities perform a disc-image backup only to a shared-controller disc/tape. Use the **F** (filecopy) command (volume or file-by-file) for separate-controller disc/tapes.

88140 Ordering Information

88140	*Not separately orderable as a complete product*
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
9300-0767	Head cleaning swabs (box of 50) (10 included w/88140)
92193F	Magnetic head cleaning solution

9111A Graphics Tablet

The 9111A is a medium-resolution HP-IB/HP-GL tablet suitable for menu/object picking, free-hand graphics entry and digitizing of existing images. The 9111A is ANSI A/ISO A4 size and includes a stylus with tip-switch and a platen overlay.

For systems which support HP-HIL, the 46087/88A digitizers are more economical, have higher resolution and support a 4-button cursor as well as a stylus.

The current 9111A is identical to the 9111T (no longer available). The 9111T, in turn, was a 9111A Option 050 (no longer available). Option 050 supports local cursor tracking on a 1350A/S or 1351A/S graphics translator on the same HP-IB interface.

9111A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9111A	A-size tablet	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
9111A	A-size tablet	4.0	5.0	5.0	3.1

The Series 300 does not officially support the 1350/51 graphics translators.

9111A Specification Summary

Data sheet (for complete specifications)	5953-9743
Dimensions	85mmH, 440mmW, 440mmD
Weight	5.8 kg (10.8 kg shipping)
Interface and command set	HP-IB, HP-GL
Active area	300.8mmH, 218.5mmV
Resolution	0.100mm (10 lines/mm)
Static accuracy	±0.6mm over active area (@20°C) .004mm per °C
Repeatability	±1 resolution unit
Data rate	1 to 60 coord. pairs/sec. max.
Stylus motion rate	75cm/sec w/1mm dynamic accuracy
Overlay and digitized material	single sheet, electrically non-conductive, homogeneous, less than 0.5mm thick
Platen softkey menu	16 key locations
AC voltage required	100, 120, 220, 240 Vac, ±10%
AC frequency tolerance	48 to 66 Hz
AC power required	25 Watts, max.

9111A HP-IB Characteristics

SH1, AH1, T5, TE0, L4, LE0, SR1, RL0, PP2, DC1, DT0, C0.

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9111A	A-size tablet	1	0...30	1	N or H	0.0m	None

9111A/Series 300 Interfacing

The 9111A may be used with a built-in or 98624A HP-IB interface only. The 9111A does not require or use DMA.

9111A Switches	Sample Configuration
HP-IB address	6
Self test	Off
Talk only	Off

9111A/Series 300 BASIC Interfacing

Typical device specifier	706
Binaries required	HPIB, GRAPH, GRAPHX
Binaries optional	IO
Programming required	`GRAPHICS INPUT IS 706,"HPGL"`

9111A/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handler	`B0004, L0004, P0004, V0004`
Starbase handler	`/usr/lib/libddhpgl.a`

9111A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 9111A at select code 7, bus address 6.

```
# mknod /dev/tablet  c 21 0x070600
```

9111A/Series 300 HP-UX Considerations

- The 9111A has no pacing protocol. When the host computer is waiting for input from the tablet, the 9111A merely freeezes the bus handshake until the stylus is pressed. This denies use of the bus to other devices on the bus.
- During operations requiring cursor tracking, the host may be performing up to 60 I/O operations per second to/from the tablet and can consume all of the available I/O throughput on the HP-IB interface.
- For these reasons, the 9111A should be on a dedicated bus.

9111A/Series 300 Pascal Interfacing

Default volume	<none>
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)

9111A Ordering Information

9111A	A-size tablet
09111-68701	Stylus refills (2 inkless, 3 ink) (one pkg. included w/9111A)
09111-90003	9111A Operator's Manual (one included w/9111A)
09111-90004	9111A Programming Manual (one included w/9111A)
09111-90007	9111A Reference Card (one included w/9111A)
09111-90009	9111A Service Manual
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
1540-0685	Padded carrying case
7121-0988	Platen overlay, pkg. of 3 (one overlay included w/9111A)
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable

9114A Portable Disc

The 9114A is a battery operated 3½-in flexible disc drive. It is interfaced via HP-IL (not HP-HIL) and does not use a command set provided on any HP9000 computer.

9114A/Series 300 Support Summary

The 9114A does not work with the Series 300. If a 9114A is present on an HP-IL loop which is connected to a Series 300 via the 82169A HP-IB/HP-IL converter, the Series 300 may not be able to access any mass storage devices on that HP-IB bus.

9121D/S Flexible Discs

The 9121D and 9121S are 270 Kbyte 3½-in. single-sided flexible disc drives. Both are housed in a three-unit high 325mm-wide HP *Design-Plus* enclosure, are HP-IB interfaced and use the AMIGO command set. The 9121D contains two drives; the 9121S only one.

The 9121S was also supplied built-in to the 9133A, 9133B, 9133V and 9133XV Winchester discs. Much of this section applies to those discs.

The double-sided 9122D/S drives are also compatible with single-sided media and are priced only slightly higher.

Double-sided media which are formatted double-sided are unreadable in the 9121D/S. Double-sided media may also be formatted single-sided (in the 9121 and other discs), and are readable and writeable in the 9121D/S.

Auto-shutter media without a latch (e.g. double-sided media) is mechanically incompatible with early 9121D/S drives. You can upgrade these drives with a 09121-88875 kit. Two kits are required for the 9121D. Upgraded drives still accept manual shutter media.

9121/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9121D	Dual flex disc	Rev. A	Yes	Yes	4.0	5.1	3.1
9121S	Single flex disc	Rev. A	Yes	Yes	4.0	5.1	3.1

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC, Pascal).

9121 Specification Summary

Dimensions	76mmH, 325mmW, 285mmD
Weight (9121D)	4.5 kg (7.7 kg shipping)
(9121S)	3.6 kg (6.9 kg shipping)
Interface and command set	HP-IB, AMIGO
Seek time	15 ms track-to-track
	415 ms average
	1070 ms full stroke
Average latency	50 ms
Transfer rate	76.9 Kbytes/sec. max
	17.8 Kbytes/sec. sustained
I/Os per second	2

9121 Specification Summary, continued...

Formatted capacity	270336 per flex. disc
Bytes per sector	256
Sectors per track	16
Tracks per surface	66 (plus spares)
Surfaces per drive	2 (9121D), 1 (9121S)
Format options	None
Media	92191A (box of 10)
AC voltage required	86 to 125 or 195 to 250
AC frequency tolerance	48 to 66 Hz
AC power required	67 Watts max.

9121 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9121D	Dual flex. disc	1	0...7	1	N or H	0.0m	None
9121S	Single flex. disc	1	0...7	1	N or H	0.0m	None

"Drive 0" and "drive 1" are UNIT 0 and UNIT 1, respectively. The 9121S is always UNIT 0.

9121/Series 300 Interfacing

The 9121 may be used with any HP-IB interface. 98620B DMA will not provide significant performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9121D at bus address 2. See 98624A and 98625 for HP-IB cabling rules.

9121 Switches	Sample Configuration
HP-IB address	2

9121D/S Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620B DMA	2	2	2
With 98620B DMA	2	2	2

9121/Series 300 BASIC Interfacing

Typical *msus*	`:,702,0` or `:HP9121,702,0` (drive 0) `:,702,1` or `:HP9121,702,1` (drive 1)
Binaries required	DISC and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 or 2

9121/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 or 2
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

9121/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=drive 0 1=drive 1	0

Typical *mknod*s for 9121D at select code 7, bus address 2

```
# mknod /dev/md.0    b  2 0x070200
# mknod /dev/rmd.0   c 11 0x070200
# mknod /dev/md.1    b  2 0x070210
# mknod /dev/rmd.1   c 11 0x070210
```

9121/Series 300 Pascal Interfacing

Media specifier letter	N
Default volumes	:3 and 4 (if first/sole disc) :7 and 8 (if second flexible disc)
Modules required	DISCHPIB, AMIGO, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 or 2

9121 Ordering Information

9121D	Dual 3½-in. flexible disc drive
9121S	Single 3½-in. flexible disc drive
09121-88875	Auto-shutter upgrade kit for one drive mechanism
09121-90000	9121D/S Disc Memory Operator's Manual (included w/9121)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rack mount adaptor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
9121D+49A-00	Self-paced hardware service training
92191A	Single-sided flexible discs, box of 10 (one disc included w/9121)
92220R	0.3m right-angle HP-IB cable
-	Refer to the **Computer Users Catalog** *(HP Pub. No 5953-2450)* for numerous flexible disc storage accessories

9122D/S Flexible Discs

The 9122D and 9122S are 788 Kbyte 3½-in. double-sided flexible disc drives. Both are housed in a three-unit high 325mm-wide HP *Design-Plus* enclosure, are HP-IB interfaced and use the SS/80 command set. The 9122D contains two drives; the 9122S only one.

The 9122S is also supplied built-in to the 9133D, 9133H and 9153A Winchester discs. Much of this section applies to those discs.

The 9122 supports both single- and double-sided media and formats.

Manual-shutter media (no longer supplied) is mechanically incompatible with the 9122D/S.

9122/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9122D	Dual flex disc	Rev. A	Yes	Yes	4.0	5.0	3.1
9122S	Single flex disc	Rev. A	Yes	Yes	4.0	5.0	3.1

9122 Specification Summary

Dimensions	76mmH, 325mmW, 285mmD
Weight (9122D)	4.5 kg (7,7 kg shipping)
(9122S	3.6 kg (6.9 kg shipping)
Interface and command set	HP-IB, SS/80
Seek time	15 ms track-to-track 485 ms average 1742 ms full stroke
Average latency	50 ms
Transfer rate	76.9 Kbytes/sec. max 18 Kbytes/sec. sustained
I/Os per second	2
Formatting and capacities	refer to following table
Media	92192A (double-sided, box of 10) 92191A (single-sided, box of 10)
AC voltage required	86 to 127 or 195 to 253
AC frequency tolerance	48 to 66 Hz
AC power required	67 Watts max.

9122D/S Media Formats

Characteristic	Format Option			
	4	0,1	2	3
Capacity (bytes)	270336	630784	709632	788480
Bytes per sector	256	256	512	1024
Sectors per track	16	16	9	5
Tracks per surface (+spares)	66(+4)	77(+3)	77(+3)	77(+3)
Surfaces per medium (sides)	1	2	2	2

9122 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9122D	Dual flex. disc	1	0...7	1	N or H	0.0m	None
9122S	Single flex. disc	1	0...7	1	N or H	0.0m	None

"Drive 0" and "drive 1" are UNIT 0 and UNIT 1, respectively. The 9122S is always UNIT 0.

9122/Series 300 Interfacing

The 9122 may be used with any HP-IB interface. 98620 DMA will not provide significant performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9122D at bus address 2. See 98624A and 98625 for HP-IB cabling rules.

9122 Switches	Sample Configuration
HP-IB address	2

9122D/S Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620B DMA	2	2	2
With 98620B DMA	2	2	2

9122/Series 300 BASIC Interfacing

Typical *msus*	:,702,0 or :CS80,702,0 (drive 0) :,702,1 or :CS80,702,1 (drive 1)
Binaries required	CS80 and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 or 2
Format options supported	0, 1, 3, 4

TRANSFER works *only* with the 256 bytes/sector format. The 512 bytes/sector format does not work at all in BASIC.

9122/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 or 2
Driver required	cs80
Block-mode major number	0
Character-mode major number	4
Format options supported	0, 1, 3, 4

The 512 bytes/sector format has not been tested in HP-UX.

9122/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=drive 0 1=drive 1	0

Typical *mknod*s for 9122D at select code 7, bus address 2

```
# mknod /dev/md.0    b 0 0x070200
# mknod /dev/rmd.0   c 4 0x070200
# mknod /dev/md.1    b 0 0x070210
# mknod /dev/rmd.1   c 4 0x070210
```

9122/Series 300 Pascal Interfacing

Media specifier letter	Q
Default volumes	:3 and 4 (if first/sole disc) :7 and 8 (if second flexible disc)
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 or 2
Format options supported	0, 1, 3, 4

The 512 bytes/sector format has not been tested in Pascal.

9122 Ordering Information

9122D	Dual 3½-in. flexible disc drive
Option J01	Japanese manual
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
9122DB	9122D, European
9122DQ	9122D, Swiss
9122DY	9122D, Danish
9122S	Single 3½-in. flexible disc drive
Option J01	Japanese manual
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
9122SB	9122S, European
9122SQ	9122S, Swiss
9122SY	9122S, Danish
09122-90000	9122D/S Disc Memory Operator's Manual (included w/9122)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rack mount adaptor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92191A	Single-sided flexible discs, box of 10
92192A	Double-sided flexible discs, box of 10 (one disc included w/9122)
92220R	0.3m right-angle HP-IB cable
-	Refer to the **Computer Users Catalog** *(HP Pub. No 5953-2450)* for numerous flexible disc storage accessories

9123D Flexible Disc

The 9123D is a host-powered version of the 9122D. It is only compatible with the *Touchscreen-II* (45850A) PC.

9125S Flexible Disc

The 9125S is a 5¼-in. double-sided flexible disc drive. It is housed in a four-unit high 325mm-wide HP *Design-Plus* enclosure, is HP-IB interfaced and uses the SS/80 command set. The 9125S is the only external 5¼-in. flexible disc drive presently available for the HP 9000.

The 9125S supports both HP and IBM PC-DOS media formats. Utility software for accessing PC-DOS directories and files on HP 9000 systems is not presently available from HP. Such software may be available from an HP+ supplier. Contact your HP Sales Representative for more information.

Note - The 9125A is a plotter. It is long obsolete and now off support life.

9125S/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9125S	Single flex disc	Rev. A	Yes	Yes	4.0	5.0	3.1

9125S Specification Summary

Data sheet (for complete specifications)	5953-6857
Dimensions Weight	107mmH, 325mmW, 285mmD 7.3 kg, (10.4 kg shipping)
Interface and command set Seek time Average latency Transfer rate I/Os per second	HP-IB, SS/80 5 ms track-to-track 187 ms average 215 ms full-stroke 100 ms 11 Kbytes/sec. sustained 4
Formatting and capacities	refer to following table
Media	92190A (double-sided, box of 10)
AC voltage required AC frequency tolerance AC power required	86 to 127 or 195 to 253 48 to 66 Hz 75 Watts max.

9125S Media Formats

Characteristic	Format Option					
	0, 1	2	3	4	5	6
Format name	HP	DOS 2.1	1K	DOS 1.0	DOS 2.0	DOS 1.1
Capacity (bytes)	270336	368640	378880	163840	184320	327680
Bytes per sector	256	512	1024	512	512	512
Sectors per track	16	9	5	8	9	8
Tracks per surface (+spares)	66(+4)	40	37	40	40	40
Surfaces per medium (sides)	1	2	2	1	1	2

9125S HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9125S	Single flex. disc	1	0...7	1	N or H	0.0m	None

The 9125S is always UNIT 0.

9125S/Series 300 Interfacing

The 9125S may be used with any HP-IB interface. 98620B DMA will not provide significant performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9125S at bus address 2. See 98624A and 98625 for HP-IB cabling rules.

9125S Switches	Sample Configuration
HP-IB address	2

9125S Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620B DMA	4	4	4
With 98620B DMA	4	4	4

9125S/Series 300 BASIC Interfacing

Typical *msus*	`:,702,0` or `:CS80,702,0`
Binaries required	CS80 and HP-IB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1
Format options supported	0, 1, 3

TRANSFER works *only* with the 256 bytes/sector format. The 512 bytes/sector format does not work at all in BASIC.

9125S/Series 300 HP-UX Interfacing

Mountable volumes per drive	1
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4
Format options supported	0, 1, 3

The 512 bytes/sector formats have not been tested in HP-UX.

9125S/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0	0

Typical *mknod*s for 9125S at select code 7, bus address 2

```
# mknod /dev/fd   b 0 0x070200
# mknod /dev/rfd  c 4 0x070200
```

9125S/Series 300 Pascal Interfacing

Media specifier letter	Q
Default volume	:3
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1
Format options supported	0, 1, 3

The 512 bytes/sector formats have not been tested in Pascal.

9125S Ordering Information

9125S	Single 5¼-in. flexible disc drive
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
9125SB	9125S, European
9125SQ	9125S, Swiss
9125SY	9125S, Danish
09125-90000	9125S/S Disc Memory Operator's Manual (included w/9125)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rack mount adaptor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92190A	Double-sided flexible discs, box of 10 (one disc included w/9125)
92220R	0.3m right-angle HP-IB cable
-	Refer to the **Computer Users Catalog** *(HP Pub. No 5953-2450)* for numerous flexible disc storage accessories

9130/31 Flexible Discs

The 9130A, 9130K and 9131G are 5¼-in. double sided flexible disc drives. The 9130A is a host-powered disc compatible only with the HP 86 computer. The 9130K and its replacement, the 9131G, are the internal discs used in the HP 9000 Model 226, 236 and 520.

9130/31/Series 300 Support Summary

The Series 300 does not support any internal disc drives.

9133A/B Winchester Discs

The 9133A and 9133B are 5 and 10 Mbyte (respectively) AMIGO/HP-IB Winchester discs with built-in 3½-in. single-sided flexible disc drive. Both discs are no longer supplied.

These discs are essentially a 9134A or 9134B stand-alone Winchester disc with shared-controller 9121S flexible disc built-in. This section only includes information unique to the 9133 package.

The standard 9133A emulates a 9895A with four units (4×1.15 Mbytes). The 9133A Option 010 (factory jumper change) and 9133B have single-unit Winchester discs.

The media comments in the 9121 section apply. Some early 9133As also have the same auto-shutter incompatiblity as early 9121D/S drives.

9133A/B-Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9133A	9134A plus 9121S disc						
Standard	4×1.2 Mbyte units	Unsup.	Unsup.	Unsup.	Unsup.	5.1	3.1
Option 010	1×4.8 Mbyte volume	Unsup.	Unsup.	Unsup.	Unsup.	5.1	3.1
9133B	9134B plus 9121S disc	Unsup.	Unsup.	Unsup.	Unsup.	5.1	3.1

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC or Pascal).

9133A/B Selected Specifications

Interface and command set	HP-IB, AMIGO
Performance, formatting and capacities:	
Winchester disc	refer to 9134A, 9134B
Flexible disc	refer to 9121S

9133A/B HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9133A	5 Mb Winchester/flex. disc	2	0...7	1	N or H	0.0m	None
9133B	10 Mb Winchester/flex. disc	2	0...7	1	N or H	0.0m	None

The Winchester disc is UNIT 0 in the 9133B and the 9133A Option 010. The 9133A (standard) Winchester disc represented UNITs 0, 1, 2 and 3. Each of the four units emulates a unit of the 9895A disc. The flexible disc is also UNIT 0, but at its own bus address. There is a single HP-IB connector.

9133A/B-Series 300 Interfacing

The 9133A/B may be used with any HP-IB interface. 98620 DMA will provide some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9133A at bus addresses 0 and 3. See 98624A and 98625 for HP-IB cabling rules. Refer to 9121D/S and 9134A/B for recommended interleaves.

9133A/B Switches	Example Configuration
Winchester HP-IB address	0
Flexible HP-IB address	2

9133A/B-Series 300 BASIC Interfacing

Typical *msus*	:,700,0 or :HP9895,700,0 (9133A std., unit 0) :,700,1 or :HP9895,700,1 (9133A std., unit 1) :,700,2 or :HP9895,700,2 (9133A std., unit 2) :,700,3 or :HP9895,700,3 (9133A std., unit 3) :,700,0 or :HP913XA,700,0 (9133A Option 010 or 9133B) :,702,0 or :HP9121,702,0 (flexible disc)
Binaries required	DISC and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	2 (9133A Option 010 or 9133B) 5 (9133A standard)

9133A/B-Series 300 HP-UX Interfacing

Mountable volumes per drive	2 (9133A Option 010 or 9133B) 5 (9133A standard)
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

9133A/B-Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0 to 4	0

Typical *mknod*s for 9133A (standard) at select code 7, bus addresses 0 and 2

```
# mknod /dev/hd9133.0    b  2  0x070000
# mknod /dev/rhd9133.0   c 11  0x070000
# mknod /dev/hd9133.1    b  2  0x070010
# mknod /dev/rhd9133.1   c 11  0x070010
# mknod /dev/hd9133.2    b  2  0x070020
# mknod /dev/rhd9133.2   c 11  0x070020
# mknod /dev/hd9133.3    b  2  0x070030
# mknod /dev/rhd9133.3   c 11  0x070030
# mknod /dev/md          b  2  0x070200
# mknod /dev/rmd         c 11  0x070200
```

9133A/B-Series 300 HP-UX Considerations:

- The 9133A and 9133B do not have adequate performance for use as a sole HP-UX system disc. It is also not possible to install HP-UX on these discs (alone) because the HP-UX flexible disc distribution media is double-sided.
- The 9133A/B also should not be used as a virtual memory (VM) swapping device. They are best suited for private volume data.

9133A/B-Series 300 Pascal Interfacing

Media specifier letter	H (9133A std. Winchester) U (9133A Option 010 Winchester) V (9133B Winchester) N (flexible disc)
Default volumes	:3 (flexible disc) :11 thru 14 (9133A standard), each 1 152 000 bytes :11 thru 14 (9133A Option 010), each 1 206 272 bytes :11 thru 19 (9133B), eight are 1 071 360, last is 1 111 040
Modules required	DISCHPIB, AMIGO, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	5 (9133A) 2 to 10 (9133B)

9133D Winchester Disc

The 9133D is a 15/16 Mbyte SS/80 HP-IB Winchester disc with built-in 3½-in. double-sided flexible disc drive. It is housed in a five-unit high HP 325mm-wide *Design Plus* enclosure. Via a configuration switch, the Winchester disc may be partitioned into one to eight unequal-size independently addressable volumes. For new purchases, the 9133H offers higher capacity (20/22 Mbytes) at a lower price.

The 9133D is essentially a 9134D with built-in shared-controller 9122S double-sided flexible disc. This section describes only those aspects of the 9133D which are unique to the 9133 bundle.

The 9133D Winchester disc has two capacities based on whether 256 bytes/sector (standard) or 1024 bytes/sector (Option 001) is specified. The format is determined by a factory-installed jumper, unlike the flexible disc, where the format is software controlled.

The media comments in the 9122 section apply.

9133D/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9133D	9134D plus 9122S disc						
Standard	14.8 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	16.6 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1

9133D Selected Specifications

Interface and command set	HP-IB, SS/80
Performance, formatting and capacities:	
Winchester disc	refer to 9134D
Flexible disc	refer to 9122S

9133D HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9133D	14/16 Mb Winchester/flex. disc	1	0...7	1	N or H	0.0m	None

The Winchester disc is UNIT 0 and the flexible disc in UNIT 1. Depending on the setting of the configuration switch on the rear of the drive, the Winchester disc may also have 1 to 8 VOLUMEs (refer to 9134D for details).

HP-IB "addresses" 8 and 9 set the 9133D to address 0, and reverse the UNIT numbers. The flexible disc becomes UNIT 0 and the Winchester disc becomes UNIT 1. This affects boot ROM system search order.

9133D/Series 300 Interfacing

The 9133D may be used with any HP-IB interface. 98620 DMA will provide performance improvement. See 98624A and 98625 for HP-IB cabling rules. Refer to 9122D/S and 9134D for suggested interleaves.

The examples which follow assume a built-in HP-IB at select code 7 and a 9133D Option 001 at bus address 0. This example also assumes configuration switch setting 7, providing an 11.00 Mbyte volume for HP-UX (AXE) and two 2.70 Mbyte volumes for LIF (BASIC/Pascal).

9133D Switches	Example Configuration
HP-IB address	0
Configuration switch	7

9133D/Series 300 BASIC Interfacing

Typical *msus*	:,700,0,1 or :CS80,700,0,1 (Winchester volume 1) :,700,0,2 or :CS80,700,0,2 (Winchester volume 1) :,700,1 or :CS80,700,1 (flexible disc)
Binaries required	CS80 and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 plus number of volumes on Winchester disc (1 thru 8)
Flex. disc format options supported	0, 1, 3, 4

In the example above we do not access the 11 Mbyte volume #0 used by HP-UX. TRANSFER works *only* with the 256 bytes/sector format. The flex. disc 512 bytes/sector format does not work at all in BASIC.

9133D/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 plus number of volumes on Winchester disc (1 thru 8)
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4
Flex. disc format options supported	0, 1, 3, 4

9133D/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	HP-IB Address	Unit Number	Volume
Values (hex)	07 to 1F	00 to 07	0 (Winchester) 1 (flexible)	0 to 7

Typical *mknod*s for 9133D Option 001, config 7, at select code 7, bus address 0

```
# mknod /dev/hd9133    b 0  0x070000
# mknod /dev/rhd9133   c 4  0x070000
# mknod /dev/hdlif.1   b 0  0x070001
# mknod /dev/rhdlif.1  c 4  0x070001
# mknod /dev/hdlif.2   b 0  0x070002
# mknod /dev/rhdlif.2  c 4  0x070002
# mknod /dev/md        b 0  0x070010
# mknod /dev/rmd       c 4  0x070010
```

9133D/Series 300 HP-UX Considerations:

- The 9133D has adequate performance for use as a single-user HP-UX system disc. It is possible to install the HP-UX AXE on this disc, although the complete HP-UX system will not fit.

9133D/Series 300 Pascal Interfacing

Media specifier letter	`Q`
Default volumes	:3 (flexible disc) :11 thru 24, depending on configuration switch setting. Exact capacity data was not available at time of publication.
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 plus number of Winchester volumes (1 to 4, 6 or 8) if using disc's partitions; 1 plus 1 to 16 if using Pascal soft volumes (unmodified CTABLE)
Flex. disc format options supported	0, 1, 3, 4

9133D Ordering Information

9133D	14.8 Mbyte Winchester disc and double-sided 3½-in. flexible disc
Option 001	1024 bytes/sector format (16.6 Mbyte capacity)
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
Option 902	Power cord for South America, Middle East and Africa
09133-90040	9133/34D Disc Drives Operator's Manual (included w/9133/34D)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rackmount adaptor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92191A	Single-sided flexible discs, box of 10
92192A	Double-sided flexible discs, box of 10 (one disc included w/9122)
92220R	0.3m right-angle HP-IB cable
-	Refer to the **Computer Users Catalog** *(HP Pub. No 5953-2450)* for numerous flexible disc storage accessories

9133H Winchester Disc

The 9133H is a 20/22 Mbyte SS/80 HP-IB Winchester disc with built-in 3½-in. double-sided flexible disc drive. It is housed in a five-unit high HP 325mm-wide *Design Plus* enclosure. Via a configuration switch, the Winchester disc may be partitioned into one to eight equal size independently addressable volumes.

The 9133H is essentially a 9134H with built-in shared-controller 9122S double-sided flexible disc. This section describes only those aspects of the 9133H which are unique to the 9133 bundle.

The 9133H Winchester disc has two capacities based on whether 256 bytes/sector (standard) or 1024 bytes/sector (Option 001) is specified. The format is determined by a factory-installed jumper, unlike the flexible disc, where the format is software controlled.

The media comments in the 9122 section apply.

9133H/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9133H	9134H plus 9122S disc						
Standard	19.9 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	22.3 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1

9133H Selected Specifications

Interface and command set	HP-IB, SS/80
Performance, formatting and capacities:	
Winchester disc	refer to 9134H
Flexible disc	refer to 9122S

Configuration switch setting 9 is the same as 0 and 1 (see 9134H), except that the UNIT assignments of the Winchester and flexible disc drives are reversed. That is, the flexible disc becomes UNIT 0 and the Winchester disc becomes UNIT 1.

9133H HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9133H	20/22 Mb Winchester/flex. disc	1	0...7	1	N or H	0.0m	None

The Winchester disc is UNIT 0 and the flexible disc is UNIT 1. Depending on the setting of the configuration switch on the rear of the drive, the Winchester disc may also have 1 to 8 VOLUMEs (refer to 9134H for details).

HP-IB "addresses" 8 and 9 set the 9133H to address 0, and reverse the UNIT numbers. The flexible disc becomes UNIT 0 and the Winchester disc becomes UNIT 1. This affects boot ROM system search order.

9133H/Series 300 Interfacing

The 9133H may be used with any HP-IB interface. 98620 DMA will provide performance improvement. See 98624A and 98625 for HP-IB cabling rules. Refer to 9134H and 9121S for recommended interleaves.

The examples which follow assume a built-in HP-IB at select code 7 and a 9133H Option 001 at bus address 0. This example also assumes configuration switch setting 2, providing an 11 Mbyte volume for HP-UX (AXE) and an 11 Mbyte volume for LIF (BASIC/Pascal).

9133H Switches	Example Configuration
HP-IB address	0
Configuration switch	2

9133H/Series 300 BASIC Interfacing

Typical *msus*	:,700,0,1 or :CS80,700,0,1 (Winchester volume 1) :,700,1 or :CS80,700,1 (flexible disc)
Binaries required	CS80 and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 plus number of volumes on Winchester disc (1 thru 8)
Flex. disc format options supported	0, 1, 3, 4

In the example above we do not access the 11 Mbyte volume #0 used by HP-UX. TRANSFER works *only* with the 256 bytes/sector format. The flex. disc 512 bytes/sector format does not work at all in BASIC.

9133H/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 plus number of volumes on Winchester disc (1 thru 8)
Driver required	cs80
Block-mode major number	0
Character-mode major number	4
Flex. disc format options supported	0, 1, 3, 4

9133H/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Volume
Values (hex)	07 to 1F	00 to 07	0 (Winchester) 1 (flexible)	0 to 7

Typical *mknod*s for 9133H Option 001, config 2, at select code 7, bus address 0

```
# mknod /dev/hd9133    b 0  0x070000
# mknod /dev/rhd9133   c 4  0x070000
# mknod /dev/hdlif.1   b 0  0x070001
# mknod /dev/rhdlif.1  c 4  0x070001
# mknod /dev/md        b 0  0x070010
# mknod /dev/rmd       c 4  0x070010
```

9133H/Series 300 HP-UX Considerations:

- The 9133H has adequate performance for use as a single-user HP-UX system disc. It is possible to install the HP-UX AXE on this disc, although the complete HP-UX system will not fit.

9133H/Series 300 Pascal Interfacing

Media specifier letter	Q
Default volumes	:3 (flexible disc) :11 thru 31, depending on configuration switch setting. Exact capacity data was not available at time of publication.
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 plus 1 to 8 on Winchester disc if using configuration switch. 1 plus 1 to 22 if using unmodified CTABLE and Pascal soft volumes.
Flex. disc format options supported	0, 1, 3, 4

9133H Ordering Information

9133H	19.9 Mbyte Winchester disc and double-sided 3½-in. flexible disc
Option 001	1024 bytes/sector format (22.3 Mbyte capacity)
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
Option 902	Power cord for South America, Middle East and Africa
9133HB	19.9 Mbyte Winchester disc, European version
9133HQ	19.9 Mbyte Winchester disc, Swiss version
9133HY	19.9 Mbyte Winchester disc, Danish version
09133-90070	Getting Started with Your 9133/9134 Disc Drive (included w/9134/34H)
09133-90071	Using Your 9133/9134 Disc Drive (included w/9134/34H)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rackmount adaptor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92191A	Single-sided flexible discs, box of 10
92192A	Double-sided flexible discs, box of 10 (one disc included w/9122)
92220R	0.3m right-angle HP-IB cable
-	Refer to the **Computer Users Catalog** *(HP Pub. No 5953-2450)* for numerous flexible disc storage accessories

9133V/XV Winchester Discs

The 9133V and 9133XV are 5 and 15 Mbyte (respectively) AMIGO/HP-IB Winchester discs with built-in 3½-in. single-sided flexible disc drive. Both discs are housed in a five-unit high HP 325mm-wide *Design Plus* enclosure. Both discs are no longer supplied.

The 9133XV is essentially a 9134XV with built-in shared-controller 9121S single-sided flexible disc. The 9133V is identical to the 9133XV except that it has a 5 Mbyte Winchester mechanism. This section describes the 9133V in detail, but only those aspects of the 9133XV which are unique to the 9133 bundle.

The 9133V (standard) is functionally equivalent to the 9133A Option 010. The 9133V Option 004 (factory jumper change) is functionally equivalent to the standard 9133A, which, in turn, emulates a 9895A with four units (4×1.15 Mbytes). The 9133V (standard) and 9133XV have single-unit Winchester discs.

The media comments in the 9121 section apply.

9133V/XV-Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9133V	5 Mbyte plus 9121S disc						
Standard	1×4.8 Mbyte volume	Rev. A	Planned	Planned	4.0	5.1	3.1
Option 004	4×1.2 Mbyte units	Rev. A	Planned	Planned	4.0	5.1	3.1
9133XV	9134XV plus 9121S disc	Rev. A	Planned	Planned	4.0	5.0	3.1

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC or Pascal).

9133V/XV Selected Specifications

Interface and command set	HP-IB, AMIGO
Performance, formatting and capacities:	
9133XV Winchester disc	refer to 9134XV
9133V/XV Flexible disc	refer to 9121S
9133V Winchester disc:	
Seek time	85 ms average
Average latency	8.3 ms
Transfer rate	50 Kbytes/sec. max sustained
I/Os per second	8
Formatting and capacities	refer to following table

9133V Media Formats

Characteristic	9133V Standard	9133V Option 004
Capacity (bytes)	4 840 960	4 608 000
Units	1	4 (each 1 152 000)
Bytes per sector	256	256
Sectors per track	31	30
Tracks per surface	305	300
Surfaces per medium	2	2

9133V/XV HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9133V	5 Mb Winchester/flex. disc	2	0...7	1	N or H	0.0m	
9133XV	15 Mb Winchester/flex. disc	2	0...7	1	N or H	0.0m	

The Winchester disc is UNIT 0 in the 9133XV and the 9133V (standard). The 9133V Option 004 Winchester disc represented UNITs 0, 1, 2 and 3. Each of the four units emulates a unit of the 9895A disc. The flexible disc is also UNIT 0, but at its own bus address. There is a single HP-IB connector.

9133V/XV-Series 300 Interfacing

The 9133V/XV may be used with any HP-IB interface. 98620 DMA will provide some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9133XV at bus addresses 0 and 3. See 98624A and 98625 for HP-IB cabling rules.

9133V/XV Switches	Example Configuration
Winchester HP-IB address	0
Flexible HP-IB address	2

9133V Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620 DMA	7	7	7
With 98620 DMA	4	3	3

These interleaves are for the 9133V Winchester disc only. Refer to 9121D/S for the flexible disc, and 9134XV for the 9133VX Winchester disc.

9133V/XV-Series 300 BASIC Interfacing

Typical *msus*	:,700,0 or :HP9895,700,0 (9133V Opt. 004, unit 0)
	:,700,1 or :HP9895,700,1 (9133V Opt. 004, unit 1)
	:,700,2 or :HP9895,700,2 (9133V Opt. 004, unit 2)
	:,700,3 or :HP9895,700,3 (9133V Opt. 004, unit 3)
	:,700,0 or :HP913X,700,0 (9133V Standard or 9133XV)
	:,702,0 or :HP9121,702,0 (flexible disc)
Binaries required	DISC and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	5 (9133V Option 004)
	2 (9133V standard or 9133XV)

9133V/XV-Series 300 HP-UX Interfacing

Mountable volumes per drive	2 (9133V standard or 9133XV) 5 (9133V Option 004)
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

9133V/XV-Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0 to 4	0

Typical *mknod*s for 9133XV at select code 7, bus addresses 0 and 2

```
# mknod /dev/hd9133    b  2  0x070000
# mknod /dev/rhd9133   c 11  0x070000
# mknod /dev/md        b  2  0x070200
# mknod /dev/rmd       c 11  0x070200
```

9133V/XV-Series 300 HP-UX Considerations:

- The 9133V and 9133XV do not have adequate performance for use as a sole HP-UX system disc. It is also not possible to install HP-UX on these discs (alone) because the HP-UX flexible disc distribution media is double-sided.
- The 9133V/XV also should not be used as a virtual memory (VM) swapping device. They are best suited for private volume data.

9133V/XV-Series 300 Pascal Interfacing

Media specifier letter	`H` (9133V Option 004 Winchester) `U` (9133V standard Winchester) `W` (9133XV Winchester) `N` (flexible disc)
Default volumes	:3 (flexible disc) :11 thru 14 (9133V Option 004) each 1 152 000 bytes :11 thru 14 (9133V standard) each 1 206 272 bytes :11 thru 34 (9133XV), 13 are 1 031 680, last is 1 111 040
Modules required	DISCHPIB, AMIGO, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	2 to 5 (9133V Option 004) 2 to 10 (9133V standard) 2 to 15 (9133XV)

9134A/B Winchester Discs

The 9134A and 9134B are 5 and 10 Mbyte (respectively) AMIGO/HP-IB Winchester discs, housed in a 130mm-high 425mm-wide desktop enclosure. Both discs are no longer supplied.

The standard 9134A emulates a 9895A with four units (4×1.15 Mbytes). The 9134A Option 010 (factory jumper change) and 9134B have single-unit Winchester discs.

9134A/B-Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9134A	5 Mb Winchester disc						
Standard	4×1.2 Mbyte units	Unsup.	Unsup.	Unsup.	5.1	Unsup.	3.1
Option 010	1×4.8 Mbyte volume	Unsup.	Unsup.	Unsup.	5.1	Unsup.	3.1
9134B	10 Mb Winchester disc	Unsup.	Unsup.	Unsup.	Unsup.	5.1	3.1

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC or Pascal).

9134A/B Selected Specifications

Interface and command set	HP-IB, AMIGO
Flexible disc characteristics	refer to 9121S
Winchester disc characteristics:	
Seek time	85 ms average
Average latency	8.3 ms
Transfer rate	50 Kbytes/sec. max sustained
I/Os per second	8
Formatting and capacities	refer to following table

9134A/B Formats

Characteristic	9134A		9134B
	Standard	Option 010	Standard
Capacity (bytes)	4608000	4825088	9681920
Units	4 (each 1152000)	1	1
Bytes per sector	256	256	256
Sectors per track	30	31	31
Tracks per surface	150	152	305
Surfaces per drive	4	4	4

9134A/B HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9134A	5 Mb Winchester/flex. disc	1	0...7	1	N or H	0.0m	None
9134B	10 Mb Winchester/flex. disc	1	0...7	1	N or H	0.0m	None

The Winchester disc is UNIT 0 in the 9134A Option 010 and 9134B. The 9134A (standard) Winchester disc represented UNITs 0, 1, 2 and 3. Each of the four units emulates a unit of the 9895A disc.

9134A/B-Series 300 Interfacing

The 9134A/B may be used with any HP-IB interface. 98620 DMA will provide some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9134A at bus address 0. See 98624A and 98625 for HP-IB cabling rules.

9134A/B Switches	Example Configuration
Winchester HP-IB address	0

9134A/B Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620 DMA	7	7	7
With 98620 DMA	4	3	3

9134A/B-Series 300 BASIC Interfacing

Typical *msus*	:,700,0 or :HP9895,700,0 (9134A std., unit 0)
	:,700,1 or :HP9895,700,1 (9134A std., unit 1)
	:,700,2 or :HP9895,700,2 (9134A std., unit 2)
	:,700,3 or :HP9895,700,3 (9134A std., unit 3)
	:,700,0 or :HP913XA,700,0 (9134A Option 010 or 9134B)
Binaries required	DISC and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 (9134A Option 010 or 9134B)
	4 (9134A standard)

9134A/B-Series 300 HP-UX Interfacing

Mountable volumes per drive	1 (9134A Option 010 or 9134B)
	1 (9134A standard)
Driver required	amigo
Block-mode major number	2
Character-mode major number	11

9134A/B-Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0 to 4	0

Typical *mknod*s for 9134A (standard) at select code 7, bus address 0.

```
# mknod /dev/hd9134.0   b  2  0x070000
# mknod /dev/rhd9134.0  c 11  0x070000
# mknod /dev/hd9134.1   b  2  0x070010
# mknod /dev/rhd9134.1  c 11  0x070010
# mknod /dev/hd9134.2   b  2  0x070020
# mknod /dev/rhd9134.2  c 11  0x070020
# mknod /dev/hd9134.3   b  2  0x070030
# mknod /dev/rhd9134.3  c 11  0x070030
```

9134A/B-Series 300 HP-UX Considerations:

- The 9134A and 9134B do not have adequate performance for use as a sole HP-UX system disc.
- The 9134A/B also should not be used as a virtual memory (VM) swapping device. They are best suited for private volume data.

9134A/B-Series 300 Pascal Interfacing

Media specifier letter	H (9134A std. Winchester) U (9134A Option 010 Winchester) V (9134B Winchester)
Default volumes	:11 thru 14 (9134A standard), each 1 152 000 bytes :11 thru 14 (9134A Option 010), each 1 206 272 bytes :11 thru 19 (9134B), eight are 1 071 360, last is 1 111 040
Modules required	DISCHPIB, AMIGO, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 to 4 (9134A) 1 to 9 (9134B)

9134D Winchester Disc

The 9134D is a 15/16 Mbyte SS/80 HP-IB Winchester disc housed in a five-unit high HP 325mm-wide *Design Plus* enclosure. Via a configuration switch, the Winchester disc may be partitioned into one to eight unequal-size independently addressable volumes. For new purchases, the 9133H offers higher capacity (20/22 Mbytes) at a lower price.

The 9134D has two capacities based on whether 256 bytes/sector (standard) or 1024 bytes/sector (Option 001) is specified. The format is determined by a factory-installed jumper, unlike the flexible disc, where the format is software controlled.

This same Winchester disc is also available with a built-in double-sided 3½-in. flexible disc drive. Refer to 9133D.

9134D/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9134D	15/16 Mbyte Winchester disc						
Standard	14.8 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	16.6 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1

9134D Specification Summary

Interface and command set	HP-IB, SS/80
Seek time	20 ms track-to-track 85 ms average 205 ms full stroke
Controller overhead	1.5 ms
Average latency	8.3 ms
Transfer rate	150 Kbytes/sec. max sustained
I/Os per second	11
Formatting and capacities	refer to following tables

9134D Formats

Characteristic	9134D	
	Standard	Option 001
Capacity (bytes)	First following table	Second following table
Units	1	1
Volumes	1 to 4, 6 and 8	1 to 4, 6 and 8
Bytes per sector	256	1024
Sectors per track	32	9
Tracks per surface	303	303
Surfaces per drive	6	6

Capacities (bytes) vs Configuration for 9134D (standard)

Switch Setting	Volume Number (and Size of Volume)							
	0	1	2	3	4	5	6	7
0 or 1	14843904	-	-	-	-	-	-	-
2	7372800	7372800	-	-	-	-	-	-
3	4915299	4915299	4915299	-	-	-	-	-
4	3637248	3637248	3637248	3637248	-	-	-	-
5	12288000	2506752	-	-	-	-	-	-
6	2408448	2408448	2408448	2408448	2408448	2408448	-	-
7	9830400	2457600	2457600	-	-	-	-	-
8	1769472	1769472	1769472	1769472	1769472	1769472	1769472	1769472
9	7323648	2457600	2457600	2457600	-	-	-	-

Capacities (bytes) vs Configuration for 9134D Option 001

Switch Setting	Volume Number (and Size of Volume)							
	0	1	2	3	4	5	6	7
0 or 1	16644095	-	-	-	-	-	-	-
2	8239104	8239104	-	-	-	-	-	-
3	5474304	5474304	5474304	-	-	-	-	-
4	4036608	4036608	4036608	4036608	-	-	-	-
5	13768704	2764800	-	-	-	-	-	-
6	2654208	2654208	2654208	2654208	2654208	2654208	-	-
7	11003904	2709504	2709504	-	-	-	-	-
8	1935360	1935360	1935360	1935360	1935360	1935360	1935360	1935360
9	8183808	2709504	2709504	2709504	-	-	-	-

9134D HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9134D	15/16 Mb Winchester disc	1	0...7	1	N or H	0.0m	None

The Winchester disc is UNIT 0. There are 1 to 4, 6 or 8 VOLUMES depending on the configuration switch setting.

9134D/Series 300 Interfacing

The 9134D may be used with any HP-IB interface. 98620 DMA will provide some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9134D at bus address 0. See 98624A and 98625 for HP-IB cabling rules. Refer to the 9133D section for an example of a multi-volume configuration.

9134D Switches	Sample Configuration
Winchester HP-IB address	0
Configuration switch	0

9134D Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620 DMA	7	7	7
With 98620 DMA	4	3	3

9134D/Series 300 BASIC Interfacing

Typical *msus*	`:,700` or `:CS80,700`
Binaries required	CS80 and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 to 4, 6 or 8

TRANSFER works *only* with the 256 bytes/sector format (9133D standard).

9134D/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 to 4, 6 or 8
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

9134D/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Volume Number
Values (hex)	07 to 1F	00 to 07	0 to 4	0 to 7

Typical *mknod*s for 9134D (standard) at select code 7, bus address 0.

```
# mknod /dev/hd9134    b 0  0x070000
# mknod /dev/rhd9134   c 4  0x070000
```

9134D/Series 300 HP-UX Considerations:

- The 9134D has adequate performance for use as a single-user HP-UX system disc. It is possible to install the HP-UX AXE on this disc, although the complete HP-UX system will not fit.

9134D/Series 300 Pascal Interfacing

Media specifier letter	`Q`
Default volumes	:11 thru 36, depending on configuration.
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 to 4, 6 or 8 if using only switch configured volumes. 1 to 16 if using unmodified CTABLE and you allow Pascal to configure soft volumes

9134D Ordering Information

9134D	14.8 Mbyte Winchester disc
Option 001	1024 bytes/sector format (16.6 Mbyte capacity)
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
Option 902	Power cord for South America, Middle East and Africa
09133-90040	9134/34D Disc Drives Operator's Manual (included w/9134/34D)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rackmount adaptor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable

9134H Winchester Disc

The 9134H is a 20/22 Mbyte SS/80 HP-IB Winchester disc housed in a five-unit high HP 325mm-wide *Design Plus* enclosure. Via a configuration switch, the Winchester disc may be partitioned into one to eight equal-size independently addressable volumes.

The 9134H has two capacities based on whether 256 bytes/sector (standard) or 1024 bytes/sector (Option 001) is specified. The format is determined by a factory-installed jumper, unlike a flexible disc, where the format is software controlled.

This same Winchester disc is also available with a built-in double-sided 3½-in. flexible disc drive. Refer to 9133H.

9134H/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9134H	20/22 Mbyte Winchester disc						
Standard	19.9 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	22.3 Mbyte format	Rev. A	Yes	Yes	4.0	5.0	3.1

9134H Specification Summary

Data sheet (for complete specifications)	5953-6857
Dimensions	132mmH, 325mmW, 285mmD
Weight (9133H)	10.4 kg (13.8 kg shipping)
(9134H)	8.7 kg (15.5 shipping)
Interface and command set	HP-IB, SS/80
Seek time	20 ms track-to-track
	85 ms average
	205 ms full stroke
Controller overhead	1.5 ms
Average latency	8.3 ms
Transfer rate	150 Kbytes/sec. max sustained
I/Os per second	11
Formatting and capacities	refer to following tables
AC voltages	86 to 127, 195 to 253
AC frequency tolerance	48 to 66 Hz
AC power required	125 Watts

9134H Formats

Characteristic	9134H	
	Standard	Option 001
Capacity (bytes)	See following table	See following table
Units	1	1
Volumes	1 to 8	1 to 8
Bytes per sector	256	1024
Sectors per track	32	9
Tracks per surface	612	612
Surfaces per drive	4	4

Capacities (bytes) vs Configuration for 9134H

Switch Setting	9134H Standard Volume Size	9134H Option 001 Volume Size	Number of Volumes
0, 1, 9	19922688	22338560	1
2	9928488	11095040	2
3	6618880	7371776	3
4	4947712	5491712	4
5	3931904	4348928	5
6	3276544	3611648	6
7	2817792	3095552	7
8	2457344	2690048	8

9134H HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9134H	20/22 Mb Winchester disc	1	0...7	1	N or H	0.0m	None

The Winchester disc is UNIT 0. There are 1 to 8 VOLUMES depending on the configuration switch setting.

9134H/Series 300 Interfacing

The 9134H may be used with any HP-IB interface. 98620 DMA will provide some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9134H at bus address 0. See 98624A and 98625 for HP-IB cabling rules. Refer to the 9133H section for an example of a multi-volume configuration.

9134H Switches	Example Configuration
Winchester HP-IB address	0
Configuration switch	0

9134H Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620 DMA	6	6	5
With 98620 DMA	4	4	3

9134H/Series 300 BASIC Interfacing

Typical *msus*	:,700 or :CS80,700
Binaries required	CS80 and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 to 4, 6 or 8

TRANSFER works *only* with the 256 bytes/sector format (9133H standard).

9134H/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 to 4, 6 or 8
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

9134H/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	HP-IB Address	Unit Number	Volume Number
Values (hex)	07 to 1F	00 to 07	0 to 4	0 to 7

Typical *mknod*s for 9134H (standard) at select code 7, bus address 0.

```
# mknod /dev/hd9134    b 0  0x070000
# mknod /dev/rhd9134   c 4  0x070000
```

9134H/Series 300 HP-UX Considerations:

- The 9134H has adequate performance for use as a single-user HP-UX system disc. It is possible to install the HP-UX AXE on this disc, although the complete HP-UX system will not fit.

9134H/Series 300 Pascal Interfacing

Media specifier letter	`Q`
Default volumes	:11 thru 36, depending on configuration.
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 to 8 if using only switch configured volumes. 1 to 22 if using unmodified CTABLE and you allow Pascal to configure soft volumes

9134H Ordering Information

9134H	19.9 Mbyte Winchester disc
Option 001	1024 bytes/sector format (16.6 Mbyte capacity)
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
Option 902	Power cord for South America, Middle East and Africa
9134HB	19.9 Mbyte Winchester disc, European version
9134HQ	19.9 Mbyte Winchester disc, Swiss version
9134HY	19.9 Mbyte Winchester disc, Danish version
09133-90070	Getting Started with Your 9133/9134 Disc Drive (included w/9134/34H)
09133-90071	Using Your 9133/9134 Disc Drive (included w/9134/34H)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rackmount adaptor
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable

9134XV Winchester Disc

The 9134XV is a 15 Mbyte AMIGO/HP-IB Winchester discs housed in a five-unit high HP 325mm-wide *Design Plus* enclosure. It is no longer supplied.

This same Winchester disc was also available with a built-in single-sided 3½-in. flexible disc drive. Refer to 9133XV.

9134XV/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9134XV	15 Mbyte Winchester disc	Rev. A	Planned	Planned	4.0	5.0	3.1

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC or Pascal).

9134XV Selected Specifications

Interface and command set	HP-IB, AMIGO
Seek time	17 ms track-to-track 85 ms average 205 ms full stroke
Average latency	8.3 ms
Transfer rate	50 Kbytes/sec. max sustained
I/Os per second	8
Formatted capacity	14522880
Bytes per sector	256
Sectors per track	31
Tracks per surface	305
Surfaces per drive	6

9134XV HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9134XV	15 Mb Winchester/flex. disc	1	0...7	1	N or H	0.0m	

The Winchester disc is UNIT 0.

9134XV/Series 300 Interfacing

The 9134XV may be used with any HP-IB interface. 98620 DMA will provide some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9134XV at bus address 0. See 98624A and 98625 for HP-IB cabling rules.

9134XV Switches	Example Configuration
Winchester HP-IB address	0

9134XV Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620 DMA	7	7	7
With 98620 DMA	4	3	3

9134XV/Series 300 BASIC Interfacing

Typical *msus*	:,700 or :HP913X,700,0
Binaries required	DISC and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	4

9134XV/Series 300 HP-UX Interfacing

Mountable volumes per drive	4
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

9134XV/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0	0

Typical *mknod*s for 9134XV at select code 7, bus address 0

```
# mknod /dev/hd9134   b  2  0x070000
# mknod /dev/rhd9134  c 11  0x070000
```

9134XV/Series 300 HP-UX Considerations:

- The 9134XV does not have adequate performance for use as a sole HP-UX system disc.
- The 9134XV also should not be used as a virtual memory (VM) swapping device. It is best suited for private volume data.

9134XV/Series 300 Pascal Interfacing

Media specifier letter	U
Default volumes	:11 thru 34, 13 are 1 031 680, last is 1 111 040
Modules required	DISCHPIB, AMIGO, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 to 14

9135A Winchester Disc

The 9135A is a 5 Mbyte AMIGO/HP-IB Winchester disc with built-in 5¼-in. single-sided flexible disc drive. It is no longer supplied.

This disc is essentially a 9134A stand-alone Winchester disc with shared-controller 82902M flexible disc built-in. This section only includes information unique to the 9135 package.

The standard 9135A emulates a 9895A with four units (4×1.15 Mbytes). The 9135A Option 010 (factory jumper change) has a single-unit Winchester disc.

9135A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9135A	9134A plus 82902M disc						
Standard	4×1.2 Mbyte units	Unsup.	Unsup.	Unsup.	Unsup.	5.1	3.1
Option 010	1×4.8 Mbyte volume	Unsup.	Unsup.	Unsup.	Unsup.	5.1	3.1

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC or Pascal).

9135A Selected Specifications

Interface and command set	HP-IB, AMIGO
Performance, formatting and capacities:	
Winchester disc	refer to 9134A
Flexible disc	refer to 82902M

9135A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9135A	5 Mb Winchester/flex. disc	2	0...7	1	Normal	0.0m	None

The Winchester disc is UNIT 0 in the 9135A Option 010. The 9135A (standard) Winchester disc represented UNITs 0, 1, 2 and 3. Each of the four units emulates a unit of the 9895A disc. The flexible disc is also UNIT 0, but at its own bus address. There is a single HP-IB connector.

9135A/Series 300 Interfacing

The 9135A may be used with any HP-IB interface except the 98625. 98620 DMA will provide some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9135A at bus addresses 0 and 3. See 98624A for HP-IB cabling rules. Refer to 82902M and 9134A for recommended interleaves.

9135A Switches	Example Configuration
Winchester HP-IB address	0
Flexible HP-IB address	2

9135A/Series 300 BASIC Interfacing

Typical *msus*	:,700,0 or :HP9895,700,0 (9135A std., unit 0) :,700,1 or :HP9895,700,1 (9135A std., unit 1) :,700,2 or :HP9895,700,2 (9135A std., unit 2) :,700,3 or :HP9895,700,3 (9135A std., unit 3) :,700,0 or :HP913XA,700,0 (9135A Option 010) :,702,0 or :HP8290X,702,0 (flexible disc)
Binaries required	DISC and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	2 (9135A Option 010) 5 (9135A standard)

9135A/Series 300 HP-UX Interfacing

Mountable volumes per drive	2 (9135A Option 010) 5 (9135A standard)
Driver required	`amigo`
Block-mode major number	2
Character-mode major number	11

9135A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0 to 4	0

Typical *mknod*s for 9135A (standard) at select code 7, bus addresses 0 and 2

```
# mknod /dev/hd9135.0    b  2  0x070000
# mknod /dev/rhd9135.0   c 11  0x070000
# mknod /dev/hd9135.1    b  2  0x070010
# mknod /dev/rhd9135.1   c 11  0x070010
# mknod /dev/hd9135.2    b  2  0x070020
# mknod /dev/rhd9135.2   c 11  0x070020
# mknod /dev/hd9135.3    b  2  0x070030
# mknod /dev/rhd9135.3   c 11  0x070030
# mknod /dev/fd          b  2  0x070200
# mknod /dev/rfd         c 11  0x070200
```

9135A/Series 300 HP-UX Considerations:

- The 9135A does not have adequate performance for use as a sole HP-UX system disc.
- The 9135A also should not be used as a virtual memory (VM) swapping device. It is best suited for private volume data.

9135A/Series 300 Pascal Interfacing

Media specifier letter	`H` (9135A std. Winchester) `U` (9135A Option 010 Winchester) `N` (flexible disc)
Default volumes	:3 (flexible disc) :11 thru 14 (9135A standard), each 1 152 000 bytes :11 thru 14 (9135A Option 010), each 1 206 272 bytes
Modules required	DISCHPIB, AMIGO, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	2 to 10 (9135A Option 010) 5 (9135A standard)

HP 9138A Winchester/Flexible Disc

The 9138A is a bundled 9134A (standard) and 9895A Option 010 (single drive) in their own packages. The 9138A is no longer supplied. Refer to the separate 9134A and 9895A products for support and interfacing information.

HP 9142A Cartridge Tape Drive

The 9142A is a stand-alone ¼-in. cartridge tape drive designed for use with HP Series 100 computers and the IBM PC. The 9142A is not planned for support on any HP9000 system. The supported stand-alone cartridge tape drive for HP9000 systems is the 9144A, which offers higher performance, data integrity and full 9144/88140 compatibility.

The tape media used in the 9144 and 9142A are different. The 9144 uses DC600/615 cartridges pre-formatted with 256-byte data, spare and maintenance frames, and provides 16 or 67 Mbytes capacity. The 9142A uses *unformatted* DC600/615 tapes, providing 15 or 60 Mbytes capacity. If you have both a 9142A and 9144 (or 88140) drive, observe the following cautions:

- The 92242L/S unformatted media used in the 9142A is identified by its blue label stating simply "Data Cartridge", and by the tape takeup reels, which are blank.

  92242 media is mechanically compatible with 88140 and 9144 mechanisms. Because it does not have the pre-formatted frames, it cannot be initialized and used in an 88140 or 9144 drive. No data is lost from the 92242 tape should you attempt this.

- The 88140LC/SC media used in the 9144 and 88140 is identified by its silver label stating "CERTIFIED DATA CARTRIDGE", and by the take-up reels which bear the red legend "PREFORMATTED - DO NOT DEGAUSS. *Note* - Older uncertified 88140L/S media has different labels and unmarked reels.

  88140 media is mechanically compatible with the 9142A drive. The 9142A can initialize, write and read 88140 media; however, this erases the frame pre-formatting on the 88140 media. *88140 media which has been initialized or written on by a 9142A drive is rendered* **unusable** *for use in 88140 or 9144 drives. HP strongly recommends that you* **do not use 88140 media in the 9142A.**

9144 Cartridge Tape Drive

The 9144A is a stand-alone CS/80 HP-IB ¼-in. streaming* cartridge tape drive, supplied in a five-unit high 325mm-wide HP *Design-Plus* enclosure. "9144" (without the "A") is the nomenclature for either the 9144A stand-alone drive or the same drive mechanism as built-in to the 7942A and 7946A disc/tape drives.

The other ¼-in. cartridge tape drive supported by HP 9000 systems is the "88140". Tapes are fully interchangable between 9144 and 88140 drives. The major differences between the 9144 drive and the 88140 drive are:

- the 9144 has read-while-write, which eliminates a separate verification operation when writing tapes (this is automatically enabled);
- the 9144 has "immediate report" mode (supported only by Series 200/300 HP-UX), which assists in keeping the 9144 streaming.

The discs which include an 9144 offer only shared-controller operation. Shared-controller supports push-button disc→tape and tape→disc copy. Separate-controller operation (separate disc and 9144A tape drive in this case) has less adverse impact on multi-tasking systems (such as HP-UX) during tape operations.

¼-in. cartridges tapes are accessed more like discs than conventional (9-track) tapes. It is possible to seek to and re-write individual 1024-byte blocks. In an emergency, a disc-image tape can be mounted in HP 9000 operating systems and treated as a (very slow) file system.

The 9144 (and 88140) drives use either 88140SC (150-ft. 16 Mbyte) or 88140LC (600-ft. 67 Mbyte) tapes. These tapes are pre-formatted and pre-certified (i.e. have bad blocks spared). The older 88140S and 88140L tapes were not pre-certified. Due to minor alignment differences between drives, it is always a good idea to re-certify (initialize) a tape for use on a given drive.

The industry designation for these tapes is DC600 and DC615 (although HP only supports HP media). DC300 and HP 92242L/S tapes are not pre-formatted and do not work. De-gaussed tapes are unusable.

9144/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9144A	Stand-alone tape drive	Rev. A	Yes	Yes	4.0	5.0	3.1
9144	Built-in to 7942/46A	Rev. A	Yes	Yes	4.0	5.0	3.1

* The 9144 drives provide best performance when the system reads or writes with no delay between records or uses large records (≥10 Kbytes). Short records with pauses between them causes poor performance and excess drive wear.

9144 Specification Summary

9144A Data sheet (for complete specifications)	5953-6834
9144A Dimensions	125mmH, 325mmW, 285mmD
9144A Weight	8.67 kg
9144 Dimensions	refer to host 7942/46 disc
9144 Weight	refer to host 7942/46 disc
Interface and command set	HP-IB, CS/80
Read/write speed	60 ips
Search speed	90 ips
Density	10000 cpi
Read-while-write	Yes
Immediate report	Yes
Data transfer rate	34 Kbytes/sec. maximum sustained
Formatted capacity	16744448 bytes (88140SC tape) 66977200 bytes (88140LC tape)
Bytes per frame	256
Frames per block	4
Blocks per track	88140SC: 1024 max. 88140LC: 4096 max.
Blocks per tape	16352 (88140SC), plus 32 spare 240 maint. 65408 (88140LC) plus 128 spare 240 maint.
Tracks	16
Format options	None
AC voltage required	90 to 125, 180 to 250
AC frequency tolerance	48 to 66 Hz
AC power required	125 Watts max.

9144 HP-IB Characteristics

Note - In the case of the built-in 9144, this information duplicates that provided for the host disc.

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9144A	Stand-alone drive	1	0...7	1	H or N	0.0m	None
9144	Built-in drive	Uses disc's	NA	NA	H or N	0.0m	see host disc

The 9144A is UNIT 0. The 9144 is UNIT 1 in a shared-controller configuration (at the host disc's bus address).

9144/Series 300 Interfacing

Any HP-IB interface is suitable. 98620 DMA provides some performance improvement and a 98625 or Series 300 built-in HP-IB provides less overhead per transaction than a 98624A interface. The examples which follow assume a built-in HP-IB at select code 7 and a 9144A at bus addresses 2. See 98624A and 98625 for HP-IB cabling rules.

9144 Switches	Example Configuration
HP-IB address	2

9144/Series 300 BASIC Interfacing

Recommended interleave	1
Typical *msus*	`:,702,0` or `:CS80,702,0`
Binaries required	CS80 and HPIB and/or FHPIB (for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1

The BASIC tape copy utilities perform a disc-image backup only to a shared-controller disc/tape. Use the `COPY` command (volume or file) for separate-controller disc/tapes.

9144/Series 300 HP-UX Interfacing

Recommended interleave	1
Mountable volumes per drive	1*
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

9144/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0= 9144A 1= built-in	0

Typical *mknod*s for 9144A at select code 7, bus address 4.

```
# mknod /dev/ct   b 0 0x070400
# mknod /dev/rct  c 4 0x070400
```

9144/Series 300 HP-UX Considerations:

- Disc I/O on the same bus can slow to one I/O per second during tape operations (such as backup). For this reason, it is also suggested that the 9144A tape drive be placed on a separate bus from the disc. This is not possible with the built-in 9144 of the 7942/46 discs.

9144/Series 300 Pascal Interfacing

Recommended interleave	1
Mass storage letter specifier	`Q`
Default volume	:41
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 (to 30, if disc-image)

The Pascal tape copy utilities perform a disc-image backup only to a shared-controller disc/tape. Use the `F` (filecopy) command (volume or file-by-file) for separate-controller disc/tapes.

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* Disc-image tape cartridges are also "mountable" as file systems. Treating the tape as a disc is very slow and accelerates mechanism wear. This should only be done as an emergency proceedure (e.g. recovery of purged file). Tapes produced by 7914 push-button backup **are not mountable**.

9144 Ordering Information

9144A	¼-in. Cartridge Tape Drive
9144	Built-in tape drive - *not separately orderable - refer to 7942/46*
09144-90000	9144A Tape Drive Operator's Manual (one included w/9144A)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rack-mount adaptor
5955-3442	CS/80 Instruction Set Programming manual
5955-3456	Site Environmental Requirements for Disc/Tape Drives
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
88140LC	600-ft. (67.0 Mbyte) ¼-in. tape cartridge (one included w/9144A)
88140SC	150-ft. (16.7 Mbyte) ¼-in. tape cartridge
9144A+49A-00	Self-paced hardware service training
92220R	0.3m right-angle HP-IB cable
9300-0767	Head cleaning swabs (box of 50) (10 included w/9144)
92193F	Magnetic head cleaning solution
92193H	Magnetic head cleaning kit

9153A Winchester Disc

The 9153A is a 10 Mbyte SS/80 HP-IB Winchester disc with a built-in 3½-in. double-sided flexible disc drive. It is housed in a four-unit high HP 325mm-wide *Design Plus* enclosure. Via a configuration switch, the Winchester disc may be partitioned into 1, 2, 4 or 8 equal size independently addressable volumes.

The 9153A is essentially a 9154A with built-in shared-controller 9122S double-sided flexible disc. This section describes only those aspects of the 9153A which are unique to the 9153 bundle.

The media comments in the 9122 section apply.

9153A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9153A	9154A plus 9122S disc	Rev. A	Yes	Yes	4.0	5.0	3.1

9153A Selected Specifications

Interface and command set	HP-IB, SS/80
Performance, formatting and capacities:	
Winchester disc	refer to 9154A
Flexible disc	refer to 9122S

9153A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9153A	10 Mb Winchester/flex. disc	1	0...7	1	N or H	0.0m	None

The Winchester disc is normally Unit 0 and the flexible disc Unit 1. The Winchester disc may have 1 to 8 VOLUMEs (refer to 9154A for details). HP-IB "addresses" 8 and 9 set the 9153A to address 0, and reverse the UNIT numbers. The flexible disc becomes UNIT 0 and the Winchester disc becomes UNIT 1. This affects boot ROM system search order.

9153A/Series 300 Interfacing

The 9153A may be used with any HP-IB interface. 98620 DMA provide performance improvement. See 98624A and 98625 for HP-IB cabling rules.

The examples which follow assume a built-in HP-IB at select code 7 and a 9153A Option 001 at bus address 0. This example also assumes configuration switch setting of "OC", providing four 2.5 Mbyte volumes.

9153A Switches	Example Configuration
HP-IB address	0
Configuration switch	OC (refer to 9154A for details)

9153A/Series 300 BASIC Interfacing

Typical *msus*	:,700,0,0 or :CS80,700,0,0 (Winchester volume 0) :,700,0,1 or :CS80,700,0,1 (Winchester volume 1) :,700,0,2 or :CS80,700,0,2 (Winchester volume 2) :,700,0,3 or :CS80,700,0,3 (Winchester volume 3) :,700,1 or :CS80,700,1 (flexible disc)
Binaries required	CS80 and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1 plus number of volumes on Winchester disc (1, 2, 4 or 8)
Flex. disc format options supported	0, 1, 3, 4

TRANSFER works *only* with the 256 bytes/sector format. The flexible disc 512 bytes/sector format does not work at all in BASIC.

9153A/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 plus number of volumes on Winchester disc (1, 2, 4 or 8)
Driver required	cs80
Block-mode major number	0
Character-mode major number	4
Flex. disc format options supported	0, 1, 3, 4

9153A/Series 300 HP-UX Driver Minor Number

Bits	**23-16**	**15-8**	**7-4**	**3-0**
Fields	Select Code	HP-IB Address	Unit Number	Volume
Values (hex)	07 to 1F	00 to 07	0 (Winchester) 1 (flexible)	0 to 7

Typical *mknod*s for 9153A, config "OC", at select code 7, bus address 0

```
# mknod /dev/hd9153.0    b 0  0x070000
# mknod /dev/rhd9153.0   c 4  0x070000
# mknod /dev/hd9153.1    b 0  0x070001
# mknod /dev/rhd9153.1   c 4  0x070001
# mknod /dev/hd9153.2    b 0  0x070002
# mknod /dev/rhd9153.2   c 4  0x070002
# mknod /dev/hd9153.3    b 0  0x070003
# mknod /dev/rhd9153.3   c 4  0x070003
# mknod /dev/md          b 0  0x070010
# mknod /dev/rmd         c 4  0x070010
```

9153A/Series 300 HP-UX Considerations:

- The 9153A has adequate performance for use as a single-user HP-UX system disc. It is possible to install only the HP-UX AXE on this disc, and then only if it is configured as a single volume (i.e. not as in the above example).

9153A/Series 300 Pascal Interfacing

Media specifier letter	Q
Default volumes	:3 (flexible disc) :11 thru 19, depending on configuration switch setting. Exact capacity data was not available at time of publication.
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1 plus 1, 2,4 or 8 on Winchester disc if using configuration switch. 1 plus 1 to 9 if using unmodified CTABLE and Pascal soft volumes.
Flex. disc format options supported	0, 1, 3, 4

9153A Ordering Information

9153A	10 Mbyte Winchester disc and double-sided 3½-in. flexible disc
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
Option 902	Power cord for South America, Middle East and Africa
9153AB	10 Mbyte Winchester disc, European version
9153AQ	10 Mbyte Winchester disc, Swiss version
9153AY	10 Mbyte Winchester disc, Danish version
09153-90000	9153/54A Operator's Manual (included w/9134/34H)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rack mount adaptor
5958-4122	9153/54A Service Manual
5958-4123	9153/54A Service Handbook pages
5958-4124	3½-in. Winchester mechanism Service Handbook pages
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
9154A+49A-00	9153/54 Self-paced hardware service training
92191A	Single-sided flexible discs, box of 10
92192A	Double-sided flexible discs, box of 10 (one disc included w/9122)
92220R	0.3m right-angle HP-IB cable
-	Refer to the **Computer Users Catalog** *(HP Pub. No 5953-2450)* for numerous flexible disc storage accessories

9154A Winchester Disc

The 9154A is a 10 Mbyte SS/80 HP-IB Winchester disc housed in a four-unit high HP 325mm-wide *Design Plus* enclosure. Via a configuration switch, the Winchester disc may be partitioned into 1, 2, 4 or 8 equal-size independently addressable volumes.

This same Winchester disc is also available with a built-in double-sided 3½-in. flexible disc drive. Refer to 9153A.

9154A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9154A	10 Mbyte Winchester disc	Rev. A	Yes	Yes	4.0	5.0	3.1

9154A Specification Summary

Data sheet (for complete specifications)	5953-6857
Dimensions	106mmH, 325mmW, 295mmD
Weight	8.31 kg
Interface and command set	HP-IB, SS/80
Seek time	22 ms track-to-track 85 ms average 150 ms full stroke
Controller overhead	1.5 ms
Average latency	10 ms
Transfer rate	174 Kbytes/sec. max sustained
I/Os per second	11
Formatted capacity	10006272
Bytes per sector	256
Sectors per track	28
Tracks per surface	698
Surfaces per drive	2
AC voltage required	86 to 127, 195 to 253 Vac
AC frequency tolerance	48 to 66 Hz
AC power required	100 Watts

9154A Formats

The number of volumes is determined by a pair of DIP switches on the removable HP-IB interface module. The switches are #3 and 4 of SW1. In the following table "O"=Open and "C"=closed.

Characteristic	Volume Select Switches			
	CC	CO	OC	OO
Volumes	1	2	4	8
Capacity (bytes) of each volume	10006272	5003008	2494208	1246976

9154A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9154A	10 Mb Winchester disc	1	0...7	1	N or H	0.0m	None

The Winchester disc is UNIT 0. There are 1 to 8 VOLUMES depending on the configuration switch setting.

9154A/Series 300 Interfacing

The 9154A may be used with any HP-IB interface. 98620 DMA provides some performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9154A at bus address 4. See 98624A and 98625 for HP-IB cabling rules. Refer to the 9153A section for an example of a multi-volume configuration.

9154A Switches	Example Configuration
HP-IB address	4
Configuration switch	"CC" (single 10 Mbyte volume)

9154A Suggested Interleaves

	98624A	Built-in	98625
Without 98620 DMA	7	7	7
With 98620 DMA	4	3	3

9154A/Series 300 BASIC Interfacing

Typical *msus*	`:,704` or `:CS80,704`
Binaries required	CS80 and HPIB (or FHPIB for 98625)
Binaries optional	MS, TRANS
LIF Directories per drive	1, 2, 4 or 8

9154A/Series 300 HP-UX Interfacing

Mountable volumes per drive	1, 2, 4 or 8
Driver required	`cs80`
Block-mode major number	0
Character-mode major number	4

9154A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Volume Number
Values (hex)	07 to 1F	00 to 07	0 to 4	0 to 7

Typical *mknod*s for 9154A (standard) at select code 7, bus address 4.

```
# mknod /dev/hd9154    b 0  0x070400
# mknod /dev/rhd9154   c 4  0x070400
```

9154A/Series 300 HP-UX Considerations:

- The 9154A has adequate performance for use as a single-user HP-UX system disc. It is possible to install the HP-UX AXE on this disc (via separate flexible disc drive), although the complete HP-UX system will not fit.

9154A/Series 300 Pascal Interfacing

Media specifier letter	Q
Default volumes	:11 thru 19, depending on configuration.
Modules required	DISCHPIB, CS80, and DMA (if using 98620 DMA), and DISC_INTF (if using 98625)
Modules optional	ASC_AM, WS1.0_AM, TEXT_AM
LIF Directories per drive	1, 2, 4 or 8 if using only switch configured volumes. 1 to 9 if using unmodified CTABLE and you allow Pascal to configure soft volumes

9154A Ordering Information

9154A	10 Mbyte Winchester disc
Option 900	U.K. power cord for Hong Kong, Malaysia and Singapore
Option 901	Power cord for Australia, New Zealand and Argentina
Option 902	Power cord for South America, Middle East and Africa
9154AB	10 Mbyte Winchester disc, European version
9154AQ	10 Mbyte Winchester disc, Swiss version
9154AY	10 Mbyte Winchester disc, Danish version
09153-90000	9153/54A Operator's Manual (included w/9134/34H)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
19500B	19-in. EIA rack mount adaptor
5958-4122	9153/54A Service Manual
5958-4123	9153/54A Service Handbook pages
5958-4124	3½-in. Winchester mechanism Service Handbook pages
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
9154A+49A-00	9153/54 Self-paced hardware service training
92220R	0.3m right-angle HP-IB cable

92205A/C 1200 bps Modem

The 92205A/C is a Hayes *Smartmodem™ 1200*. It is a Bell 103 or 212A compatible modem for use at data rates of 0 to 300 and 1200 bits/sec. It may be used in auto-dial, auto-answer, manual connect and leased-line configurations. The 92205A is licensed for use the U.S. and the 92205C is licensed for use in the U.S. or Canada.

The HP 37212A modem has similar capabilities and is licensed for use in most countries which permit privately owned modems.

92205A/C-Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
92205A	1200 bps modem, U.S.	NOP	Yes	Yes	Unsup.*	5.0	Unsup.*
92205C	1200 bps modem, Canada	NOP	Yes	Yes	Unsup.*	5.0	Unsup.*

92205A/C Specification Summary

Data sheet (for complete specifications)	None
Dimensions	38.1mmH, 139.7mmW, 243.8mmD
Computer/terminal interface	RS-232C
Datacomm interface	Bell modular jack, compatible with RJ11C, RJ11W, RJ12C, RJ12W, RJ13C, RJ13W
FCC ringer equivalence	0.4B
FCC registration number	BFJ9D908-68245-DM-E
Transmit level	-10 dBm max. (600 ohm)
Receive Sensitivity	-45 dBm
Connect methods	Pulse or DTMF (tone) dialling
Data rates (baud)	0 to 300 bps (Bell 103) 1200 bps (Bell 212A), asynchronous or synchronous (automatic speed detection)
Character length	7 or 8 data bits, 1 or 2 stop bits
Configuration	commands and/or internal switches
Diagnostics	self-test
AC voltage required	13.5 Vac, 9.5 VA max. (AC adaptor is 120 Vac, 60 Hz)

* The 92205A/C has been tested with the Pascal-based HP 2392A terminal emulator software. However, neither BASIC nor Pascal provide any transparent software support for modems.

92205A/C-Series 300 Interfacing

The 92205A/C may be used with any Series 300 RS-232C interface, although it is not recommended for use with the three hard-wired ports of the 98642A Mux because those ports cannot monitor the modem control lines. The examples which follow assume that the 92205A/C is connected to the built-in interface at select code 9.

The suggested interface is any RS-232C interface cabled to provide a DTE(M) connection, such as the built-in interface with 13242N (Model 310) or 92221M (Model 320) cable. The interface should be configured (if possible) for 1200 baud, 8 bits/character, no parity, Xon/Xoff handshake, modem status lines connected.

Host Connection	Peripheral Cable	Peripheral	Comments
DTE(M)	Implied by DTE(M)	92205A/C	All configurations

92205A/C Switch or jumper	Sample initial Configuration	Comments
S1	Up	Modem hangup on loss of DTR
S2	Up	Result codes in English words
S3	Down	Result codes not inhibited
S4	Up	Echo command characters
S5	Up	Auto-answer enabled
	Down	Auto-answer disabled
S6	Up	Assert CD line on carrier detect
		Force CD true
S7	Up	Single-line RJ11 jack
S8	Down	Enable command recognition
Volume	→	As desired

92205A/C-Series 300 BASIC Interfacing

Typical device specifier	9
Binaries required	SERIAL or DCOMM (98628A)
Binaries optional	IO
Programming required	`CONTROL 9,3;1200*` (on 98644A or built-in RS232)

92205A/C-Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1
Autodialer	`ACUHP92205A/C` in *dialit.c*

* This is the minimum programming required for modems setup in a leased-line configuration. Additional programming of interface control registers will probably be required before data can be transfered. Monitoring of status registers is also required for auto-answer and in applications using unreliable dial-up lines.

92205A/C-Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
				Access Type			
Fields	Select Code	98642A port*	Not Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	00 to 03	0	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod*s for 92205A/C at select code 9

```
# mknod /dev/tty02   c 1 0x090001
# mknod /dev/cua02   c 1 0x090000
# mknod /dev/cul02   c 1 0x090001
```

The *dialit.c* autodialler program overrides switch settings 2, 3, 4 and 5. If you are also using the Pascal-based terminal emulator, or are using *cu* to directly command the modem, you may safely set switches 2...5 as desired.

92205A/C-Series 300 Pascal Interfacing

Default volume	None
Modules required	RS232 or DATA_COMM (98628A)
Modules optional	None
Programming required	Significant

92205A/C Ordering Information

92205A	Hayes *Smartmodem™ 1200* (U.S.)
92205C	Hayes *Smartmodem™ 1200* (Canada or U.S.)
15561A	Bell-style 2.1m RJ-11C modular telephone cable (2.0m RJ11-to-RJ11 cable included)
92203R	Out-of-warranty fixed repair charge
92203X	HP Express Service (for 92203R)

* For 98642A Mux ports only, otherwise zero (0).

92205B 2400 bps Modem

The 92205B is a Hayes *Smartmodem 2400™*. It is a Bell 103/212A and CCITT V.22 compatible modem for use at data rates of 0 to 300, 600, 1200 and 2400 bits/sec. It may be used in auto-dial, auto-answer, manual connect and leased-line configurations. The 92205B is licensed for use in the U.S. and Canada.

92205B/Series 300 Support Summary

Testing of the 92205B was in progress at time of publication.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
92205B	2400 bps modem	NOP	Inves.	Inves.	Unsup.*	Inves.	Unsup.*

92205B Specification Summary

Data sheet (for complete specifications)	None
Dimensions	38.1mmH, 139.7mmW, 243.8mmD
Computer/terminal interface	RS-232C, CCITT V.25
Datacomm interface	Bell modular jacks(2), compatible with RJ11, RJ12, RJ13, RJ41S, RJ45S
FCC ringer equivalence	0.7B
FCC registration number	BFJ9D9-14424-DM-E
Transmit level	-10 dBm max. (600 ohm)
Receive Sensitivity	-45 dBm
Connect methods	Pulse or DTMF (tone) dialling
Data encoding	2400 bps (V.22 bis) QAM 1200 bps (V.22 and Bell 212A) DPSK 600 bps (V.22) 0 to 300 bps (Bell 103)
Data rates (baud)	0 to 300 bps (Bell 103) 1200 bps (Bell 212A), asynchronous or synchronous (automatic speed detection)
Character length	1 start bit, 7 or 8 data bits, no parity, 1 stop bit. 7-bit may have 2 stop bits, or odd/even/one/zero parity
Configuration	commands only
Diagnostics	self-test, local analog loopback, local/remote digital loopback
AC voltage required	8.5 Vac, 7 Watts (AC adaptor is 120 Vac, 60 Hz)

* The 92205B has been tested with the Pascal-based HP2392A terminal emulator software. However, neither BASIC nor Pascal provide any transparent software support for modems.

92205B/Series 300 Interfacing

The 92205B may be used with any Series 300 RS-232C interface, although the modem port of the 98642A or the 98628A datacomm interfaces are recommended[§]. The examples which follow assume that the 92205B is connected to an interface at select code 20.

The interface must be cabled to provide a DTE(M) connection. The interface should be configured (if possible) for 2400 baud, 8 bits/character, no parity, Xon/Xoff handshake, modem status lines connected.

Host Connection	Peripheral Cable	Peripheral	Comments
DTE(M)	Implied by DTE(M)	92205B	All configurations

The 92205B itself is configured solely by ASCII commands sent by a DTE host. The easiest way to accomplish this is to connect a terminal or terminal emulator to the modem. If a terminal is not available, an HP-UX RS-232C port configured for "DIR" in the "L-devices" file should suffice. In HP-UX, you could also modify *dialit.c* to send these commands when it opens the device file.

92205B Command	Comment
AT&F	Reset modem to factory defaults (must be first command)
ATB0	Use CCITT mode at 1200 baud
AT&C1	Assert CD line on carrier detect
AT&D3	Modem hangup/reset on loss of DTR
ATE0	Disable command echoing (HP-UX only)
ATQ1	Disable all result codes from modem (HP-UX only)
ATS0=1	Answer call on first ring (HP-UX only)
AT&W	Write this configuration to non-volatile memory

92205B/Series 300 BASIC Interfacing

Typical device specifier	9
Binaries required	SERIAL or DCOMM (98628A)
Binaries optional	IO
Programming required	CONTROL 9,3;2400* (on 98644A or built-in RS232)

92205B/Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1
Autodialer	`ACUHP92205A` in *dialit.c* (modified, see below)

§ The built-in, 98626A and 98644A unbuffered RS-232C interfaces may lose characters during input of bursts of characters above 1200 baud (such as in *uucp*). These interfaces are acceptable for input at human typing rates. The three hard-wired ports of the 98642A Mux cannot monitor the modem control lines.

* This is the minimum programming required for modems setup in a leased-line configuration. Additional programming of interface control registers will probably be required before data can be transfered. Monitoring of status registers is also required for auto-answer and in applications using unreliable dial-up lines.

92205B test articles were received too late for HP-UX 5.0 changes to *dialit.c*. This modem appears to function if the command characters "C1" and "F1" are changed to blanks in *struct hayes_config*. (This may render the code unusable with Hayes 1200 baud modems and Hayes-compatible modems, such as the U.S. Robotics *Courier2400*.

To accept logins at 2400 baud, you will also need to create an *inittab* entry such as:

```
2:m1:c:/etc/getty modem 24001 240
```

and appropriate entries in *gettydefs*, such as:

```
3001# B300 # B300 SANE -PARENB CS8 IXANY ISTRIP IXANY TAB3 #login: #24001
12001# B1200 # B1200 SANE -PARENB CS8 IXANY ISTRIP IXANY TAB3 #login: #3001
24001# B2400 # B2400 SANE -PARENB CS8 IXANY ISTRIP IXANY TAB3 #login: #12001
```

92205B/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
					Access Type		
Fields	Select Code	98642A port*	Not Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	00 to 03	0	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod*s for 92205B at select code 20

```
# mknod /dev/tty02  c 1 0x140001
# mknod /dev/cua02  c 1 0x140000
# mknod /dev/cul02  c 1 0x140001
```

92205B-Series 300 Pascal Interfacing

Default volume	None
Modules required	RS232 or DATA_COMM (98628A)
Modules optional	None
Programming required	Significant

92205B Ordering Information

92205B	Hayes *Smartmodem 2400*™
15561A	Bell-style 2.1m RJ-11C modular telephone cable (2.0m RJ11-to-RJ11 cable included)
92203R	Out-of-warranty fixed repair charge
92203X	HP Express Service (for 92203R)

* For 98642A Mux ports only, otherwise zero (0).

9282-0000 Documentation Accessories

This section lists binders and documentation that is not related to specific products.

Unless noted, manuals listed in this appendix do not include binders.

Documentation Accessories Ordering Information
Refer to the 5953-2450 *Computer Users Catalog* for more information on many of these products.

5957-8401	*HP Reference Service* - a starter library of HP computer systems product information for consultants
5957-8402	*HP Reference Service* library update service (one year)
5953-2460	HP Documentation Index
5953-2460D	HP Documentation Index (domestic U.S., includes prices)
5958-0209	Half-size binder, grey with slipcover
9282-0068	Service handbook (6-ring) binder, beige
9282-0658	Full-size binder, brown, 1-in. spine
9282-0659	Full-size binder, brown, 2-in. spine
9282-0987	Full-size binder, beige, 1-5/8-in. spine insert
9282-0988	Full-size binder, beige, 1-in. spine insert
9282-0989	Full-size binder, beige, 2-3/8-in. spine insert
9282-0993	Full-size binder, beige, 2-7/8-in. spine insert
9282-1023	Half-size binder, beige, 7/8-in. spine insert
9282-1044	Half-size binder, burgundy, 7/8-in. spine insert
92171M	Full-size desktop binder/rack - holds up to 6-in. of documents in 6 removable 3-ring spines.
92171L	Locking bar for 92171M (prevents removal of spine channels)

92911A Bar Code Reader

The 92911A is a 30mmH×120mmW×160mmD "pod" with detached bar code reader wand. It is powered by its host terminal (2622A, 2623A, 2624B, 2626A/W or 2627A) and is interfaced by intercepting the keyboard cable. It emulates (but does not replace) the keyboard, and is an input-only device, switch-configured.

92911A/Series 300 Support Summary

The 92911A has not been tested with any Series 300 system and no testing/qualification is planned. The 92916A HP-HIL and 39800/01A RS-232C bar code readers are supported on the Series 300.

If you already own a 92911A and wish to try it on the Series 300, note that at data rates above 1200 baud, the burst of bar code characters from the terminal may overrun the built-in, 98626A and 98644A single-byte buffered RS-232C interfaces in a busy system.

92915A Bar Code Reader

The 92915A is a 120mm-wide "pod", styled like a 46020 keyboard, with detached bar code reader wand. It is powered by its host terminal (2392A, 45610A HP 150 or 45610B *Touchscreen PC*) and is interfaced by intercepting the keyboard cable. It emulates (but does not replace) the keyboard, and is an input-only device, switch-configured.

92915A/Series 300 Support Summary

The 92915A has not been tested with any Series 300 system and no testing/qualification is planned. The 92916A HP-HIL and 39800/01A RS-232C bar code readers are supported on the Series 300.

If you already own a 92915A and wish to try it on the Series 300, note that at data rates above 1200 baud, the burst of bar code characters from the terminal may overrun the built-in, 98626A and 98644A single-byte buffered RS-232C interfaces in a busy system.

92916A Bar Code Reader

The 92916A is a general purpose HP-HIL stand-alone bar code reader. The 92916A is housed in a 120mm-wide "pod", styled like a 46020 keyboard, with detached bar code reader wand. It may be configured (via switches) to act as a programmable ASCII device or to emulate the keyboard. Most hosts support it as an input-only device. The 92916A is user-installable.

The 92916A is compatible with the following HP-HIL hosts:
all Series 300 computer mainframes;
2393A graphics terminal;
45850A HP 150-*II*;
9807A *Integral* PC;
9817A/H/L (Series 200 Model 217);
9837H (Series 200 Model 237);
98700H display station (on Series 500 only) and
9920U Option 535 (Series 200 Model 220).

92916A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
92916A	Barcode reader	NOP*	Yes	Yes	4.0	5.0	3.1

92916A Specification Summary

Data sheet (for complete specifications)	5954-59__
Dimensions (reader)	37mmH, 120mmW, 215mmD
Dimensions (wand)	23mmH dia., 132mmL
Wand cord length	0.71 to 1.83m
Weight	1.0 kg
Interface and command set	HP-HIL, Keyboard or ASCII
Terminator character	CR, HT or ENTER keycodes
Configuration	internal switches
Scan rate (cm/sec.)	7.6 to 76
Standard bar codes	Interleaved 2-of-5, Code 39™, Codabar USD-4, ABC UPC-A, EAN-8, with or without checkdigit

92916A HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Required	Device Type	Cable Included
92916A	Bar code reader	1	2	__mA	Keyboard or ASCII	0.5m

* It may be possible to use the bar code reader to control the boot process, but this has not been tested.

92916A/Series 300 Interfacing

The 92916A may be used with any Series 300 mainframe HP-HIL interface, or by a supported terminal which uses HP-HIL, such as the 2393A or 45850A *Touchscreen-II*.

For use with a terminal, the support is provided by the terminal and is beyond the scope of this manual. Note that at data rates above 1200 baud, the burst of bar code characters from the terminal may overrun the built-in, 98626A and 98644A single-byte buffered RS-232C interfaces in a busy system.

The balance of this section discusses the 92916A supported as a local peripheral connected to a Series 300 mainframe HP-HIL interface. In this sample configuration, scanned codes are transmitted to the computer exactly as if they were typed in at an actual keyboard, followed by carriage return. Refer to 98561-66530 for a discussion of HP-HIL cabling rules.

92916A Switches	Sample Configuration	Comments
Code Selection	your choice	UPC/EAN will facilitate testing with any retail packages on hand
Transmission type	Keycode	required
Keyboard selection	per 46020	Should match your keyboard
Appended control	01	Selects [Return]
Check digit	your choice	
Field length check	Off	Unless application requires

92916A/Series 300 BASIC Interfacing

Typical device specifier	KBD (or 2)
Binaries required	None
Binaries optional	LEX (if non-U.S.)
Programming required	None

92916A/Series 300 HP-UX Interfacing

Drivers required	`console`
Drivers optional	`r8042, hil`
Block-mode major number	NA
Character-mode major number	0
	23 (r8042), 24 (hil)

For a terminal-interfaced 92916A, use the terminal interface description.

92916A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	Not Used	Location	Not Used
Console (hex)	00	0	0	0
r8042 (hex)	00	0	0	0
hil (hex)	00	0	1 to 7	0

Typical *mknod*s for 92916A as second device on Link.

```
# mknod /dev/console  c 0  0x000000
# mknod /dev/r8042    c 23 0x000000
# mknod /dev/wand     c 24 0x000020
```

92916A/Series 300 Pascal Interfacing

Default volume	2 (SYSTERM)
Modules required	HPHIL
Modules optional	None
Programming required	None

92916A Ordering Information

92916A	HP-HIL bar code reader
03075-40006	External wand holder
16800-60010	Replacement saphire wand tip
92916-90001	Operating and installation manual (one included w/92916)
5953-7732	Application Note 1013: "Elements of a Bar Code System"
92911-90101	thru -90110 Pre-printed 3 of 9 bar code labels
92911-90111	thru -90120 Pre-printed 2 of 5 bar code labels

97033A HP-UX 5.0

97033A is the initial release of the complete Series 300 multi-user HP-UX system. The information in this section supplements that found in **Chapter 2.** The 5.0 includes all of the capabilities of the following software products:

- 98597A Multi-user programming environment
- 98598A Multi-user FORTRAN 77 compiler
- 98599A Multi-user HP Pascal compiler
- 98600A AGP/DGL Graphics (skeleton handler not included)

97033A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
97033A	HP-UX 5.0	Rev. A	Yes	Yes	NA	5.0	NA

97033A Specification Summary

Data sheet (for complete specs.)	5953-9562
RAM required (total)	1.0 Mbytes (2.0 recommended for program development)
Minimum disc space required	55 Mbytes
Number of users	16 (4...8 recommended)

Native Language Support
Series 300 HP-UX 5.0 has limited support for users whose native language is other than American English. Text files may contain native-language character data. File names may contain native-language characters if the file is not *uucp*'d to a non-HP UNIX* system. User names and system *hostname*s must be U.S. ASCII.

To provide this support, several HP-UX intrinsics and commands have been enhanced to allow processing of files and keyboard entry containing 8-bit (256 symbol) characters. These are identified as "8-bit transparent". Some of these commands/intrinsics have also been enhanced to generate prompts, text output and error messages in one of several native languages. The format of output may also be according to local customs. These are identified as "localized".

Previous HP-UX systems (and most other UNIX* and UNIX*-like systems) only support 7-bit (128 symbol) character sets, and fully support only the U.S. ASCII 7-bit set.

Intrinsics and commands not listed in the following table are not compatible with 8-bit characters. Processing 8-bit character data with a 7-bit-only intrinsic or command has unpredictable results. The typical consequence is that the 8th bit is stripped off, yielding an arbitrary (but predictable) 7-bit ASCII character code.

For "localized" intrinsics/commands, HP-UX 5.0 supports (separately ordered) message catalogs in the following languages: American English, British English, Danish, Dutch, Finnish, French, German, Italian, Norwegian, Spanish, and Swedish. These include lexical ordering tables, character upshift/downshift tables, and other language-dependent information and messages.

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* UNIX is a trademark of AT&T Bell Laboratories, Inc.

NLS Compatible HP-UX Commands‡

Name(†)	NLS Level	Description
accept(1)	Localized	allow requests on an lp spooler
asa(1)	8-bit	interpret ASA FORTRAN carriage control characters
at(1)	8-bit	time schedule a process
basename(1)	8-bit	extract portions of path names
bdiff(1)	8-bit	compare (large) files
cancel(1)	Localized	cancel spooled printer output
cat(1)	Localized	concatenate and print file
cc(1)	8-bit	c compiler
cdb(1)	8-bit	c debugger
chmod(1)	8-bit	change file mode (permissions, etc.)
chown(1)	8-bit	change file owner
cmp(1)	Localized	compare two files
comm(1)	Localized	select or reject lines common to two sorted files
cp(1)	8-bit	copy a file
cpio(1)	8-bit	copy file archives in and out
cpp(1)	8-bit	c pre-processor
cut(1)	8-bit	cut out selected fields of each line of a file
cxref(1)	8-bit	c cross-reference generator
date(1)	Localized	print/set the date
dd(1)	8-bit	convert, reblock, translate and copy a (tape) file
diff(1)	Localized	differential file comparator
diffh(1)	Localized	differential file comparator, abbreviated
dircmp(1)	8-bit	directory difference comparison
disable(1)	Localized	disable a spooled printer
du(1)	8-bit	summarize disc usage
/bin/echo(1)	8-bit	echo (print) arguments
ed(1)	Localized	(line oriented) text editor
enable(1)	Localized	enable a spooled printer
env(1)	8-bit	set environment for command execution
expand(1)	8-bit	expand tabs to spaces, or vice-versa
false(1)	Localized	provide false value
fc/f77(1)	8-bit	FORTRAN 77 compiler
file(1)	8-bit	determine file type
find(1)	8-bit	find files
fsck(8)	8-bit	file system consistency check
fsdb(8)	8-bit	examine/modify file system
getopt(1)	8-bit	parse command options
lex(1)	8-bit	generate programs for lexical analysis of text
line(1)	8-bit	read one line from user input
lint(1)	8-bit	c program checker/verifier
ln(1)	8-bit	link a file

† Number denotes HP-UX Reference manual section.

‡ This is a tentative list based on the best information available at time of publication. Contact your local HP Sales Office for an updated list.

NLS Compatible HP-UX Commands, continued...

Name(†)	NLS Level	Description
login(1)	8-bit	sign-on (8-bit passwords only)
lp(1)	Localized	line printer spooler
lpadmin(1M)	Localized	configure LP spooling system
lpsched(1M)	Localized	start LP spooling system
lpshut(1M)	Localized	stop LP spooling system
ls(1)	8-bit	list contents of directories
mail(1)	8-bit	send and receive mail
mailx(1)	8-bit	send and receive mail
mkdir(1)	8-bit	make a directory
more(1)	8-bit	file browser
mv(1)	8-bit	move a file
mvdir(1)	8-bit	move a directory
ncheck(1)	8-bit	generate file names from i-numbers
newgrp(1)	8-bit	log into new group (8-bit passwords only)
nice(1)	8-bit	run a command at lower priority
nl(1)	8-bit	line numbering filter
nm(1)	8-bit	print name list (symbol table) of object file
nohup(1)	8-bit	run command with "no hangup"
od(1)	8-bit	octal and hexadecimal dump
pack(1)	8-bit	compress file
passwd(1)	8-bit	change login password
paste(1)	8-bit	merge lines in one or more files
pc(1)	8-bit	HP Pascal compiler
pcat(1)	8-bit	*cat* compressed file
pr(1)	Localized	print file(s)
ps(1)	8-bit	report process status
pwck(1M)	8-bit	password/group file checkers
pwd(1)	8-bit	print working directory
ratfor(1)	8-bit	rational FORTRAN preprocessor
reject(1)	Localized	deny LP spooler requests
rm(1)	8-bit	delete file(s)
rmnl(1)	8-bit	remove excess newlines from file
rsh(1)	8-bit	restricted *sh*
sh(1)	8-bit	bourne shell command interpreter
sort(1)	Localized	sort/merge text files
split(1)	8-bit	split a file into pieces
ssp(1)	8-bit	remove multiple line-feeds from output
su(1)	8-bit	become another user (8-bit passwords)
sum(1)	8-bit	print checksum/block count of file
tail(1)	8-bit	deliver last part of a file
tar(1)	8-bit	tape file archiver
tee(1)	8-bit	pipe fitting
touch(1)	8-bit	update file timestamp(s)
tr(1)	8-bit	translate characters
true(1)	Localized	provide truth value
ul(1)	8-bit	do underlining
uniq(1)	Localized	report repeated lines in a file
unpack(1)	8-bit	compress file
uucp(1)	8-bit	UNIX*-to-UNIX* copy

NLS Compatible HP-UX Commands, continued...

Name(†)	NLS Level	Description
wall(1)	8-bit	broadcast message to all users
wc(1)	Localized	word/line/character count
whereis(1)	8-bit	locate file and/or manual page
write(1)	8-bit	interactively write to another user
xargs(1)	8-bit	construct argument list and execute command
yacc(1)	8-bit	yet another compiler compiler

Native Language Support Library

The following library calls have been added to HP-UX to facilitate the development of fully localized programs.

NLS Library

Name(†)	Description
catread(3X)	adds MPE/RTE filetype support to *getmsg*
ctime(3C)	time conversion routines
ecvt(3C)	convert binary numbers to string numerics
nl_conv(3C)	character casefolding routines
nl_ctype(3C)	character classification
getmsg(3C)	get native language message from catalog
langinfo(3C)	get native language information
nl_string(3C)	string comparison routines
printmsg(3C)	print formatted numeric output
strtod(3C)	convert string numeric to binary number routines

Other HP-UX system and library calls are 8-bit transparent with the following exceptions. Localized versions (see above) exist for many of these, and should be used in new program development.

Non-NLS HP-UX System and Library Calls

Name(†)	Description
atof(3C)	convert ASCII string numerics to various binary forms
conv(3C)	ASCII character casefolding routines
ctime(3C)	date and time conversion routines
ctype(3C)	character classification routines
ecvt(3C)	convert binary number to ASCII string numeric
printf(3S)	output formatters
qsort(3C)	quick sort
regex(3X)	regular expression compile/execute
scanf(3S)	formatted input conversion
string(3C)	character string operations

Use of ISO7 in HP-UX

"ISO7" stands for International Standards Organization 7-bit substitution. For each ISO7 language, certain ASCII character codes infrequently used in ordinary text (such as those for "|" and "{") are designated to generate a different native-language symbol (such as "ö" and "ä" in German). Unfortunately, the designated ASCII codes represent characters *often* used, and having special meaning, in HP-UX (and all other UNIX* and UNIX*-like systems).

Entering native language characters in ISO7 mode requires "escaping" many "native language" characters in order to prevent their misinterpretation by UNIX*. To further complicate matters, the UNIX* escaping character itself, "\" ("Ö" in German) is also substituted. For example, to sort and print the file named "Öhäf.ü" in HP ROMAN8 is simply:

```
sort  Öhäf.ü  |  lp
```

Whereas ISO7 German requires the following command:

```
sort  ÖÖhÖäfÖ.ü  ö  lp
```

In fact, the command would not produce the expected result in ISO7. The standard UNIX* *sort* command uses the simple numeric value of each character code for its collating sequence, so all lines containing substitution characters would likely be out of sequence compared to where they would be found according to a German dictionary.

Commands, shell scripts and *c* programs are therefore difficult to enter and read on a peripheral configured for a 7-bit native language. For these reasons, HP-UX does not officially support the ISO7 technique. HP-UX 5.0 NLS using 8-bit character sets does not have these limitations.

97033A Ordering Information

97033A	HP-UX 5.0
Option 022	Software on ¼-in. cartridge tape
Option 100	Delete manuals
	HP-UX 5.0 Training
35128A	Introduction to HP-UX (5 days)
35128X	Introduction to HP-UX (10 students, on-site, 5 days)
Option 001	Additional student in 35128X (max. of 2)
35129A	HP-UX System Administration (3 days)
35129X	HP-UX System Administration (10 students, on-site, 3 days)
Option 001	Additional student in 35128X (max. of 2)
35130A	*C* Programming language (5 days)
35130X	*C* Programming language (10 students, on-site, 5 days)
Option 001	Additional student in 35128X (max. of 2)
	HP-UX 5.0 Support Services
97033A+H22	RCS for 97033A, software updates on Option 022 media
97033A+Q00	MUS for 97033A
97033A+S22	SMS for 97033A, software updates on Option 022 media
97033A+V00	Extended RCS for 97033A (user-copied updates)
97033A+V22	Extended RCS for 97033A (effectively includes a 97033A+S22)
97033A+W00	Extended SMS for 97033A
97033A+W22	Extended SMS for 97033A (effectively includes a 97033A+S22)

* UNIX is a trademark of AT&T Bell Laboratories, Inc.

97033A Ordering Information, continued...

	HP-UX 5.0 Documentation - refer to 9282-0000 for binders
00000-00000	HP-UX Documentation Kit
09000-90008	HP-UX Reference Manual (3 volumes, half-size)
09826-90027	*An Introduction to Programming and Problem Solving in Pascal* - Schneider & Weingart
09826-90073	MC68000 User's manual
5957-4685	FORTRAN77 Reference Manual (full-size)
5957-4686	FORTRAN77 User's Guide (_____-size)
92233C§	*OH! Pascal!* - Cooper and Clancy
92233P§	*Managing and Programming Project* - Metzger
	The Art of Computer Programming - Knuth
92233S§	Volume I: *Fundamental Algorithms*
92233T§	Volume II: *Seminumerical Algorithms*
92233U§	Volume III: *Sorting and Searching*
92233X§	*Fundamentals of Interactive Computer Graphics* - Foley & Van Dam
92234J§	*Software Tools in Pascal* - Kernighan & Plaugher
92234X§	*An Introduction to Operating Systems* - Deitel
92836-90005	*Structured FORTRAN77 Programming with HP Computers* - Seymour & Pollack
97082-90002§	*Programming in Pascal with HP Computers* - Grogono
97084-90000	DGL Programming Reference (full-size)
97084-90001	DGL Supplement for HP-UX Systems (full-size)
97084-90026	Graphics/9000 DGL Device Handlers manual (full-size)
97085-90000	AGP User's Guide (full-size)
97085-90005	AGP Programming Reference (full-size)
97085-90005	AGP Supplement for HP-UX systems (full-size)
97089-90000	*The C Programming Language* - Kernighan & Ritchie
97089-90004	HP-UX Concepts and Tutorials (6 volumes, full-size)
97089-90010	HP-UX User's Guide (_____-size)
98561-90020	Series 300 Configuration Reference manual (full-size)
98592-90010	*Starbase* Device Drivers Library (full-size)
98592-90020	*Starbase C* Pocket Reference
98592-90030	*Starbase* FORTRAN Pocket Reference
98592-90050	*Starbase* Pascal Pocket Reference
98592-90060	*Starbase* Reference (_____-size)
98615-90051	HP Pascal Language Reference (full-size)
98680-90041	HP-UX Portability Guide (full-size)
98680-90601	*User's Guide to the UNIX* System* - McGilton & Morgan

* UNIX is a trademark of AT&T Technologies.

§ These manuals are available separately.

98028A SRM Multiplexer

The 98028A is the host-powered module that connects up to 5 SRM nodes (1 to 4 workstations and 1 to 4 controllers) which are using 98629A SRM interfaces and 97061-series SRM cable. Refer to 98629A in this Appendix for further information.

9807A *Integral PC*

(as terminal emulator)

The *Integral PC* is a portable HP-UX computer. With the appropriate RS-232C interface it is capable of both asynchronous networking (*uucp, uux,* and *cu*) and HP2622A terminal emulation. Only these features of the *Integral* are described here.

Integral PC/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
9807A	*Integral PC*	Unsup.	Yes	Yes	Unsup.	5.0	Unsup.
	Localized keyboards	Unsup.	Yes	Yes	Unsup.	5.0	Unsup.

The *Integral* is unsupported by the boot ROM because the use of a RAM-based terminal emulator is discouraged due to the difficulty of isolating the problem should the Series 300 system appear to fail to boot.

The *Integral* supports HP-HIL devices only when acting as a PC under local program, control. As a terminal, most local HP-HIL devices are not supported and generate no I/O data. The 92916A bar code reader is an exception. Although the *Integral* has local graphics capability, its terminal emulation is alphanumeric only. It is not supportable as a graphics terminal on the Series 300.

Integral PC Specification Summary (as terminal emulator)

Data sheet (for complete specs.)	5954-1228
Dimensions (closed)	325mmH, 400mmW, 175mmD
Weight	11.4 kg
Screen size	9-in. diagnonal
Phosphor	Electroluminescent (Amber)
Screen capacity	25 lines × 80 columns (line 25 for status/labels)
Character resolution	5×7
Softkeys	8, programmable
Character sets	HP ROMAN8
Display enhancements	Inverse, underline
Command set	HP2622A
Modem command set	Hayes
Interface	2×RS-232C (independent); built-in modem optional
Data rates (bps)	110, 134.5, 300, 600, 1200, 2400, 4800, 9600, 19200 via RS-232C
Handshaking	Xon/Xoff (host & device), Enq/Ack (device),
Character frame	7 or 8-bits, parity odd, even, none, zeros, ones
Configuration	From keyboard, battery-backed or filed

Integral PC/Series 300 Interfacing

In order to communicate using HP 2622A emulation, the *Integral* must have the 82815J Datacomm software package and either a 82921A modem interface or an 82919A serial interface and cable.

The *Integral PC*, so equipped, is compatible with all Series 300 RS-232C interfaces. Refer to the interface card discussions for information about the interface side of the connection. The following cabling is for terminal emulation only. Refer to the 98642A discussion for *uucp* cabling (any *uucp* cabling may also be used for terminal emulation, but the converse is not true). The 9807A-side connections are as follows:

Host Connection	Uses	Terminal Cable	Terminal Connection
DCE(M)	*uucp* or terminal emulation	82974A (2m)	82919A serial interface
DIR25(F)	*uucp* or terminal emulation	82974C (2m)	82919A serial interface
Telco	Terminal emulation *only*	Modular telephone (included)	82921A modem interface

Integral PC/Series 300 HP-UX Interfacing

Terminal configuration	<see Appendix A introduction>
Interface required	built-in RS-232C, 98642A, 98644A, 98628A or 98626A
Driver required	"tty"
Block-mode major number	<none>
Character-mode major number	1
Minor number fields	<interface-dependent>
terminfo entry	`2622, hp2622`

9807A/Series 300 HP-UX Considerations:

- When used as a personal computer, it is possible to transfer files between the *Integral* and your HP-UX system.
- The *Integral* Datacomm software includes an ASCII file transfer capability using the MODEM7 protocol. An unsupported public-domain program *(umodem)*, available for UNIX*-like systems, is compatible with this protocol. Contact your local HP-UX or UNIX* user's group.
- Networking via *uucp, uux* or *cu* requires the 82856J HP-UX Tools package.
- The 98642A or 98628A interface are recommended for 9600 baud connections if there is also a 98625A interface in the system.

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* UNIX is a trademark of AT&T Technologies.

Integral PC **Ordering Information**

9807A	*Integral PC* Computer (U.S. keyboard)
9807AB	*Integral PC* Computer (European version)
9807AD	*Integral PC* Computer (German version)
9807AE	*Integral PC* Computer (Spanish version)
9807AF	*Integral PC* Computer (French version)
9807AF	*Integral PC* Computer (French version)
9807AJ	*Integral PC* Computer (Japanese version)
9807AK	*Integral PC* Computer (Universal English version)
9807AN	*Integral PC* Computer (Norwegian version)
9807AP	*Integral PC* Computer (Swiss-German version)
9807AQ	*Integral PC* Computer (Swiss-French version)
9807AS	*Integral PC* Computer (Swedish version)
9807AU	*Integral PC* Computer (U.K. version)
9807AW	*Integral PC* Computer (Belgian version)
9807AY	*Integral PC* Computer (Danish version)
9807AZ	*Integral PC* Computer (Italian version)
13269Y	Carrying case with strap
82915J	Datacomm software (2622 emulation, *umodem*)
82856J	HP-UX Tools software (includes *uucp, uux, cu*)
82919A	RS-232C serial interface (Male DTE connector, no cable)
82921A	300/1200 baud modem (with U.S. modular telephone cable)
82974A	Female-to-male DTE (modem) cable
82974C	Female-to-female DCE ("printer") cable

98242A HP-DIO Backplane

The 98242A kit is a field-installable HP-DIO backplane for a Model 310 computer which does not have one (98561A Option 004). The kit adds four HP-DIO slots: two I/O slots and two accessory slots. It does not add any system slots. This kit is customer installable.

98242A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98242A	Field-installed backplane	Rev. A	Yes	NA	4.0	5.0	3.1

98242A Ordering Information

98242A	HP-DIO backplane kit
5958-4361	Installation note (one included w/98242A)

98243A Processor Upgrade

The 98243A kit upgrades a Model 310 computer to a Model 320 computer. The kit consists of a 98561-66519 Model 320 processor board and a 98561-66530 Human Interface card. This kit is customer installable.

If you are planning to upgrade your Model 310, consider the following:

- The 98561-66530 Human Interface card is an HP-DIO interface card. It replaces the HP-IB, HP-HIL, RS-232C and audio outputs of your Model 310 processor board. It also occupies one I/O slot. If your Model 310 is a 98561A Option 004 and does not have a DIO backplane, you must also order a 98242A DIO backplane upgrade kit.

  If you already have a DIO backplane, but are using both I/O slots (or both accessory slots), you may need to order a 98658A Series 300 or 9888A Series 200 bus expander for this card (or additional RAM or video cards, below).

- Your current 98561-66511/12/13 processor board has a 25-pin RS-232C connector. The 98561-66530 card has a 9-pin RS-232C connector. If you are using built-in RS-232C, you will need to replace your current RS-232C cable. Check the 98561-66530 section and the peripheral's section in this appendix.

- The 98651-66519 Model 320 processor board has no on-board user RAM (only cache). To have a Model 320 system with the same amount of RAM as your Model 310 system, you will also need to order a 98257A 1.0 Mbyte RAM card (for a standard Model 310) or two 98256A 256 Kbyte RAM cards (for the 98561A Option 002 Model 310). You must have one (or two) HP-DIO accessory slots available for these RAM cards.

- If you are presently using the 512×400×1 video interface of your Model 310 (except the 98561A Option 003 version), you probably need to replace that video capability.

  The 98542A video interface is an exact replacement for the built-in Model 310 video and occupies the second system slot (not an HP-DIO slot).

  If you order 98543A, 98544A or 98545A video interface, you also need to order a compatible monitor. Each of these boards also occupies the second system slot.

  If you order the 98546A video compatibility interface, you can use an existing 36721/31/41 monitor, but this card *set* requires an HP-DIO I/O *and* an accessory slot (unless you do not use the graphics board).

  If you order a 98700H Option 030 Display Station, its interface card requires an I/O slot.

98243A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98243A	Processor upgrade	Rev. A	Yes	NA	4.0	5.0	3.1

98243A Ordering Information

98243A	Model 310-to-320 upgrade kit
98243-90600	Installation note (one included w/98243A)

98253A EPROM Development Kit

This product includes an EPROM programmer card which you install in any HP-DIO backplane slot. It includes a 0.2m ribbon cable which connects it to the 98255A EPROM interface card to be programmed. The 98253 is user-installable.

98253A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98253A	EPROM programmer	Rev. A	Yes	Yes	4.0	No	3.1

Revision A boot ROM support consists of identifying the card.

98253A HP-DIO Characteristics

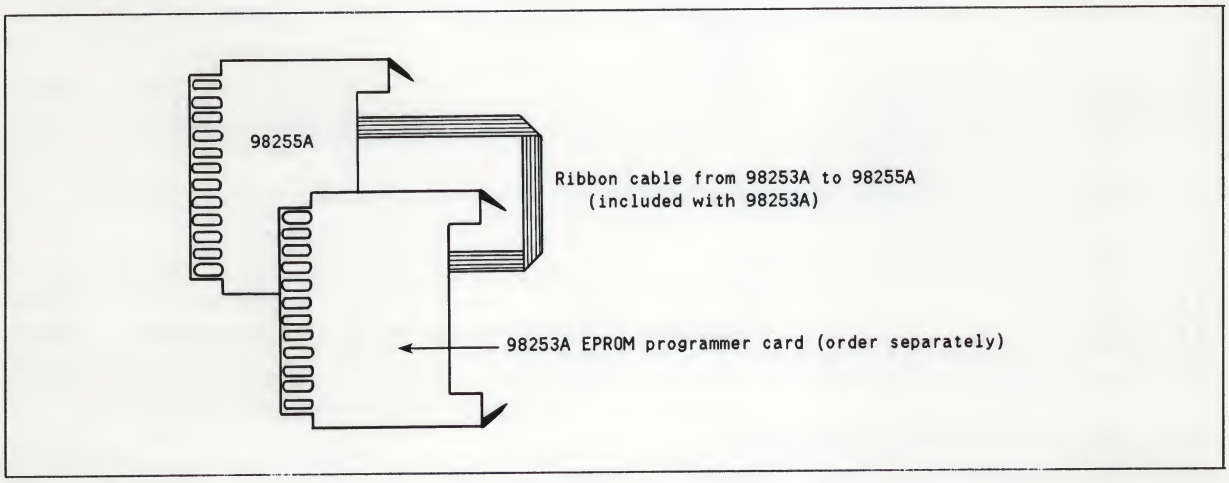
Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98253A	EPROM Programmer	1	No	27: 8 to 31	Yes	No

Unlike most "I/O" cards, this card does not have a cover plate, and may be installed in any available slot where there is a path for the ribbon cable.

Although the 98253A may be installed in a 9888A expander, the connected 98255A EPROM card may not. Due to the short length of cable (0.2m), you will probably have to install both cards in mainframe or 98568A expander slots.

98253A/Series 300 Interfacing

The 98253A is supplied with a 0.2m ribbon cable which connects to a single 98255A EPROM card to be programmed.



98253A Switches	Sample Configuration	Comments
Select code	27	Factory default

98253A/Series 300 BASIC Interfacing

Typical device specifier	`:EPROM,27`
Binaries required	EPROM
Binaries optional	MS, TRANS
Programming required	`INITIALIZE ":EPROM,27"`

BASIC supports EPROM as a mass storage device. You can create a LIF directory and files on the 98255A EPROM card, or you can write/read individual words and bytes.

98253A/Series 300 Pascal Interfacing

Default volume	`ESYS:` (42) if manual example used
Modules required	EDRIVER, EPROMS
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
Programming required	CTABLE must be modified

A utility (ETU) is provided for programming 98255A cards.

98253A Ordering Information

98253A	EPROM programmer card
98253-90000	Installation Note (one included w/98253A)

98254A 64 Kbyte RAM Card

The 98254A provides 65 535 bytes of non-parity RAM on a single HP-DIO "accessory" type card. The 98254A is no longer supplied.

98254A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98254A	64 Kbyte RAM card	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

The 98254A has not been formally tested in a Series 300 computer and no testing is planned.

98254A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98254A	64 Kbyte RAM card	1	No	None	No	Unsup.

98254A/Series 300 Interfacing

The 98254A has no cabling. The 98254A may not function properly in some Series 300 configurations. Consider the following when attempting to use the 98254A card:

- When mixing 98254A, 98256A and 98257A cards, the 98257A cards must be configured first, since their base addresses must occur on 1.0 Mbyte boundaries. Similarly, the built-in 512K or 1.0M of the Model 310 must begin on a 512K or 1.0M boundary. The 98256A cards must be configured second, since their base addresses must occur on 256 Kbyte boundaries.
- The maximum memory in a system containing any 98254A cards is 2.0 Mbyte.

98255A EPROM Card

The 98255A eraseable programmable read-only memory (EPROM) card supports up to 256 Kbytes of PROM storage using INTEL 2764 or 27128 (or equivalent, but *not* 27128A) EPROMs. These EPROMs are not available from Hewlett-Packard. This card normally appears to be a read-only disc to the system. Other uses require system-level user programming.

98255A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98255A	EPROM card	Rev. A	Yes	Yes	4.0	Unsup.	3.1

The boot ROM can boot a SYSTEM file (named "SYS...") from EPROM only if the EPROM card is initialized as a LIF file system.

98255A Specification Summary

EPROMs supported	INTEL 2764 or 27128 (not 27128A)
Card capacities (max.)	131 072 (with 2764s) 262 144 (with 27128s)
Access time (per word)	< 250 nSec
Programmer required	98253A card

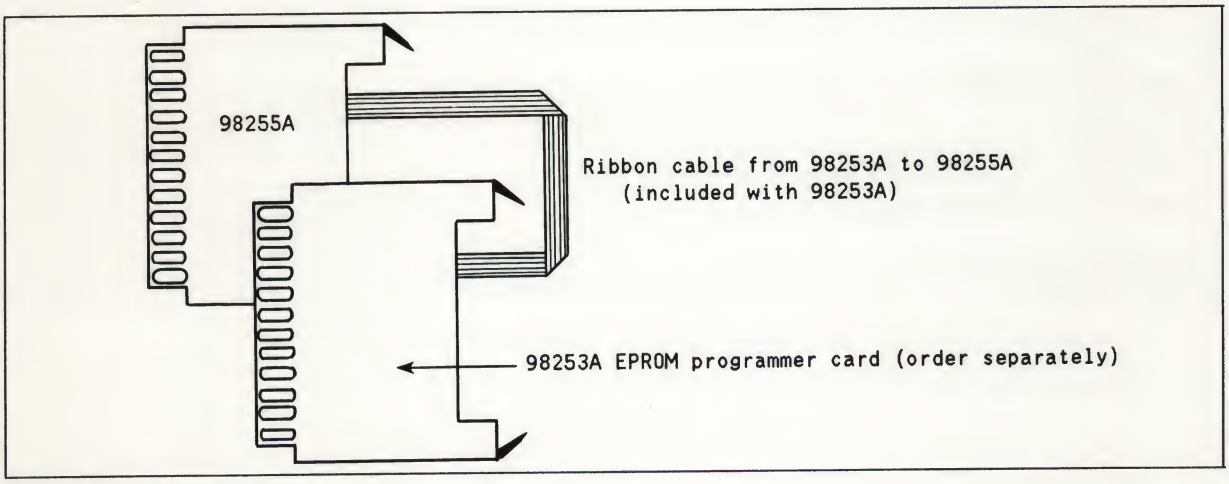
98255A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98255A	EPROM card	1	No	None	No	No

Unlike most "I/O" cards, this card does not have a cover plate, and may be installed in any available slot where there is a path for the ribbon cable from the 98253A card.

98255A/Series 300 Interfacing

The 98255A card has no cabling requirement after programming. For programming refer to 98253A.



98255A Switches	Sample Configuration	Comments
EPROM type	27128	
Address response	DA	(Auto-DTACK) Pascal requires
Address	0x300000	Unless 98287A also present

98255A/Series 300 BASIC Interfacing

Typical device specifier	`:EPROM,0,0`
Binaries required	EPROM
Binaries optional	MS, TRANS
Programming required	`MSI ":EPROM,0,0"` (if not boot device)

BASIC supports EPROM as a data storage device. You can access a LIF directory and files on the 98255A EPROM card, or you can read individual words and bytes.

98255A/Series 300 HP-UX Interfacing

It may be possible to access the 98255A card in HP-UX by using the "iomap" driver (10). Card memory locations would be accessed as offsets from the base address returned by *ioctl*. This has not been tested.

Driver required	`iomap`
Block-mode major number	NA
Character-mode major number	10

98255A/Series 300 HP-UX Driver Minor Number

Bits	23-08	7-0
Fields	Address/0x10000	64 Kbyte Regions
Values (hex)	0030 to 003E	01 to 04

Typical *mknod* for a 256 Kbyte 98255A card at address 0x300000

```
# mknod /dev/eprom  c 10 0x003004
```

98255A/Series 300 Pascal Interfacing

Default volume	`ESYS:` (42) if manual example used
Media specifier letter	`E`
Modules required	EPROMS
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
Programming required	CTABLE must be modified

98255A Ordering Information

98255A	EPROM card
98255-90000	Installation Note (one included w/98255A)

98256A 256 Kbyte RAM Card

The 98256A provides 262 144 bytes of non-parity RAM on a single HP-DIO "accessory" type card. The 98256A is user-installable.

98256A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98256A	256 Kbyte RAM card	Rev. A	Yes	Yes	4.0	5.0	3.1

98256A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98256A	256 Kbyte RAM card	1	No	None	No	Opt.

98256A/Series 300 Interfacing

The 98256A has no cabling. When mixing 98256A and 98257A cards, the 98257A cards are usually configured first, since their base addresses must occur on 1.0 Mbyte boundaries. No other action is required to use the additional RAM as user-program/data memory.

If you have both parity and non-parity RAM, the non-parity RAM should be configured to *user* space and the parity RAM to system kernel space. If you have a Model 310, refer to the 98561-66512 section for a discussion of where to configure plug-in and built-in RAM.

98256A/Series 300 BASIC Interfacing

Typical device specifier	`:,0,0` or `:MEMORY,0,0` (a MEMORY volume)
Binaries required	None
Binaries optional	MS, TRANS
Programming	`INITIALIZE ":MEMORY,0,0",1056` (create MEMORY volume)

BASIC supports up to 32 MEMORY volumes (0 to 31). The size of memory volumes (in 256-byte "sectors") is limited only by installed RAM (less RAM used for BASIC and your program).

98256A/Series 300 HP-UX Interfacing

Drivers required	None
Drivers optional	`mem, kmem, null`
Block-mode major number	NA
Character-mode major number	3

98256A/Series 300 HP-UX Driver Minor Number

Bits	23-4	3-0
Fields	Not Used	Pseudo-Device
Values (hex)	00000	0 = "mem" 1 = "kmem" 2 = "null"

Typical *mknod*s for the memory pseudo-devices

```
# mknod /dev/mem    c 3 0x000000
# mknod /dev/kmem   c 3 0x000001
# mknod /dev/null   c 3 0x000002
```

98256A/Series 300 HP-UX Considerations:

- The *mem* and *kmem* psuedo-devices allow the super-user to access physical memory and virtual memory addresses, respectively.
- HP-UX does not support memory volumes.

98256A/Series 300 Pascal Interfacing

Default volume	`RAM:` (user-specified volume number)
Media specifier letter	`R`
Modules required	None
Programming required	None

Pascal supports up to 32 MEMORY volumes.

98256A Ordering Information

98256A	256 Kbyte RAM card
98256Q	100 × 98256A (at a quantity discounted price)
5957-7953	Series 300 Memory configuration wheel (one included w/Series 300 systems)
5957-7954	Series 200 Memory configuration wheel (one included w/Series 200 systems)
98257-90000	Installation Note (one included w/98256A)

98257A 1.0 Mbyte RAM Card

The 98257A provides 1 048 576 bytes of parity RAM on a single HP-DIO "accessory" type card. The 98257A is user-installable.

98257A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
98257A	1.0 Mbyte RAM card	Rev. A	Yes	Yes	4.0	5.0	3.1
	Parity error detect	Rev. A	Yes	Yes	4.0	5.0	3.1

98257A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98257A	1.0 Mbyte RAM card	1	No	None	No	Opt.

98257A/Series 300 Interfacing

The 98257A has no cabling. When mixing 98257A and 98256A cards, the 98257A cards are normally configured first, since their base addresses must occur on 1.0 Mbyte boundaries.

If you have both parity and non-parity RAM, the non-parity RAM should be configured to *user* space and the parity RAM to system kernel space. If you have a Model 310, refer to the 98561-66512 section for a discussion of where to configure plug-in and built-in RAM.

98257A/Series 300 BASIC Interfacing

Typical device specifier	32 (parity register) :,0 or :MEMORY,0,0 (a MEMORY volume)
Binaries required	None
Binaries optional	MS, TRANS
Programming	CONTROL 32,0;0" (to disable parity detect) INITIALIZE ":MEMORY,0,0",1056 (create MEMORY volume)

98257A/Series 300 BASIC Considerations:

- After boot, the BASIC system default is parity detect on. If a parity error is detected, the system pauses your program and displays a message. Parity errors cannot be trapped by ON ERROR.
- BASIC supports up to 32 MEMORY volumes (0 to 31). The size of memory volumes (in 256-byte "sectors") is limited only by installed RAM (less RAM used for BASIC and your program).

98257A/Series 300 HP-UX Interfacing

Drivers required	None
Drivers optional	mem, kmem, null
Block-mode major number	NA
Character-mode major number	3

98257A/Series 300 HP-UX Driver Minor Number

Bits	23-4	3-0
Fields	Not Used	Pseudo-Device
Values (hex)	00000	0 = "mem" 1 = "kmem" 2 = "null"

Typical *mknod*s for the memory pseudo-devices

```
# mknod /dev/mem    c 3 0x000000
# mknod /dev/kmem   c 3 0x000001
# mknod /dev/null   c 3 0x000002
```

98257A/Series 300 HP-UX Considerations:

- The *mem* and *kmem* psuedo-devices allow the super-user to access physical memory and virtual memory addresses, respectively.
- HP-UX executes with parity enabled. If a parity error occurs in a command or user program, you can configure the system to take one of three actions:
  1. This the default action. If the error is in a user process, it is killed (this is non-trappable). If the error occurs in the kernel, the system displays a message on the console and halts.
  2. The system reports the error and halts in all cases.
  3. The system merely reports the error in all cases.
- HP-UX does not support memory volumes.

98257A/Series 300 Pascal Interfacing

Default volume	`RAM:` (user-specified volume number)
Media specifier letter	`R`
Modules required	None
Programming required	None

98257A/Series 300 Pascal Considerations:

- After boot, the Pascal system default is parity detect on. If a parity error is detected, a user program can trap the processor exception.
- Pascal supports up to 32 MEMORY volumes.

98257A Ordering Information

98257A	1.0 Mbyte RAM card
98257P	50 × 98257A (at a quantity discounted price)
5957-7953	Series 300 Memory configuration wheel (one included w/Series 300 systems)
5957-7954	Series 200 Memory configuration wheel (one included w/Series 200 systems)
98257-90000	Installation Note (one included w/98257A)

98259A Bubble Memory card

The 98259A provides 131 072 (128 K) bytes of non-volatile memory. It is an HP-DIO "accessory" style card and is user-installable.

98259A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98259A	Bubble memory card	Rev. A	Yes	Yes	4.0	No	3.1

98259A Specification Summary

Capacity (per card)	131 072 bytes
Access time	42 ms average
	90 ms max.
Data transfer rate	8 Kbytes/sec. average
Maximum cards/system	Select code limited

98259A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98259A	Bubble memory card	1	No	30: 8 to 31	Yes	No

Unlike most "I/O" cards, this card does not have a cover plate, and may be installed in any available slot.

98259A/Series 300 Interfacing

The 98259A has no cabling. The 98259A is supported as a mass storage device (e.g. electronic disc) by BASIC and Pascal.

98259A Switches	Sample Configuration	Comments
Select code	30	Factory default
Interrupt level	6 5 for second card (if any)	For first card.

98259A/Series 300 BASIC Interfacing

Typical device specifier	:,30 or :BUBBLE,30
Binaries required	BUBBLE
Binaries optional	MS, TRANS
Programming required	INITIALIZE ":BUBBLE,30"

BASIC supports bubble memory as a mass storage device. You can create a LIF directory and files on the 98255A bubble memory card, or you can write/read individual words and bytes using the PHYREC binary.

98259A/Series 300 Pascal Interfacing

Default volume	VBUB: (user specified number)
Media specifier letter	B
Modules required	BUBBLE
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
Programming required	CTABLE must be modified

98259A Ordering Information

98259A	128 Kbyte bubble memory card
98259-90000	Installation Note (one included w/98259A)

98287A Display Station Interface

The 98287A is the Series 300 interface card for the 98700 Graphics Display Station. It occupies one I/O slot and includes a cable. Because this card is most commonly ordered as part Option 030 to the 98700H, the detailed description is presented in that section.

98287/Series 300 Support Summary

Refer to 98700H for support status details. If you are converting a 98700H from Series 500 to Series 300 use, consider the following:

- The HP-HIL interface and audio output of the 98700H controller are not currently supported by any Series 300 operating systems. You will need to connect the keyboard and other HP-HIL devices to the Series 300 computer mainframe.
- Only one 98700H may be supported on the Series 300, depending on the operating system used. Check 98700H for details.
- Series 300 use requires a different interface-to-controller cable than is used with the 98288A DSB board of the Series 500. The 98287A includes the correct cable.

98287A (98700H) HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98287A	Display Station Interface	1	Yes	-	No	No
	HP-HIL	-	-	31: 8 to 31	No	No
	External control space	-	-	25: 8 to 31	No	No
	Internal control space	-	-	0x560000	No	No

The control space of the 98287A may be set to "internal" 0x560000 hexadecimal or to an "external" (select code-based) control space. The frame buffer address may be set to 0x200000, 0x300000, 0x800000 or 0x900000. The considerations for setting these parameters are covered in the 98700H section.

98287A Ordering Information

98287A	Display station interface
7121-1957	Select code labels (one set included w/98287A)
98287-90600	Installation Note (one included w/98287A)

98305A HP EGS 2.1

HP EGS is an interactive graphics editor with four personalities: general drawing, technical drawing, electrical schematic and printed circuit board. It is a stand-alone software product which includes an execute-only Pascal 3.1 environment. HP EGS is also available pre-installed on an HP 9153A disc (98305A Option 085).

HP EGS includes HP 7974A and HP 9884A utilities for the creation of 1600 cpi PE magnetic tapes, 800 cpi NRZI magnetic tapes and paper tapes. There are several companion software products for HP EGS, which are described separately: 98310A HP EGS Photoplotter and N/C Drill Tape Utilities, 98311A HP EGS IGES Translator and 98819A HP TechWriter.

HP EGS has specific minimum system requirements (RAM, disc, video display) and a mouse or tablet is strongly recommended.

98305A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98305A/R	HP EGS 2.1	Rev. A	Yes	Yes	NA	NA	3.1

98305A Specification Summary

Data sheet (for complete specs.)	5953-4698
RAM required (total, stand-alone)	2.0 Mbytes
Minimum disc space required	10 Mbytes
Supported peripherals:	
Video display	Any supported on Series 300. Color is recommended. Use of the 98627A color graphics interface requires a separate alpha display. Option 035 is suggested for the 13279B monitor used with the 98627A.
Mass Storage	Any supported by Pascal 3.1 (subject to minimum capacity of 10 Mbytes)
Interchange	HP 7974A (standard or Option 800), HP 9884A with 5061-1854 cable
Plot-to-file	Local or SRM file
Plotters	7586B, 7585A/B, 7580A/B, 7550A, 7475A#002, 7470A#002, 9872B/C/S/T
Graphics printers	2225A, 2631G, 2671G, 2673A, 2932A, 2933/34A, 82906A, 9876A
Text-only printers	2631B, 2671A
Human input	HP 46060A mouse, HP 46087/88A tablets, Summagraphics MG3648 E-size digitizer, HP 9111A tablet
Security	Codeword: requires 46084A ID module (not included) connected to mainframe

Without a valid codeword (or without the correct 46084A ID module), HP EGS operates only in "demo" mode. The 98305A/R products include a *Codeword* certificate. After delivery of the 46084A ID module, HP issues to you (via telephone) a unique "codeword" which is keyed to the serial number of your ID module.

You may type in the codeword upon each installation, or use a supplied utility to install it in a file. The codeword unlocks the full capability of HP EGS on any Series 200 or 300 computer to which that specific ID module is connected. The ID module must remain connected while HP EGS is executing.

You may secure different software products to the same ID module; however, this reduces their portability. Each 46084A has a unique serial number. If you lose a 46084A, you must obtain a new certificate (and codeword) for the replacement 46084A. In the case of HP EGS, you can obtain a new certificate by ordering 98305R Option 100.

98305A/Series 300 Pascal Interfacing

HP EGS may be linked and executed as a normal application program in the full Pascal 3.1 system. The 46084A ID module is still required.

98305A Ordering Information

98305A	HP EGS (includes certificate, manual set and software)
Option 042	Software on 5¼-in. flexible disc (internal interleave)
Option 044	Software on 3½-in. flexible disc (single-sided format)
Option 085	Software pre-installed on 9153A Winchester disc (included). Also includes back-up copy on Option 044 media and 2.0m HP-IB cable.
98305R	Right-to-copy 98305A with sublicense (includes certificate) Prior or concurrent purchase of 98305A required
Option 085	Software pre-installed on 9153A Winchester disc (included).
Option 100	Delete manuals (i.e. certificate only)
	HP EGS Upgrades (uses existing codeword - includes one manual set)
98305-17421	HP EGS 2.0 to 2.1 upgrade on 5¼-in. media
98305-17441	HP EGS 2.0 to 2.1 upgrade on 3½-in. media
	HP EGS Training
35032B	General consulting
	HP EGS Support Services
98305A+Q00	MUS for 98305A
98305A+S00	SMS for 98305A, software updates on same media as Pascal system if 98615C+x42 or 98615C+x44 services in effect, otherwise also order...
99061F+S42	SMS for 98305A, software updates on Option 042 media
99061F+S44	SMS for 98305A, software updates on Option 044 media
98305A+W00	Extended SMS for 98305M/R
99107F+T00	AMS for computer-aided ME family products
99107F+H00	RCS for computer-aided ME family products
99107F+V00	Extended AMS/RCS for computer-aided ME family products
	HP EGS Documentation
5953-9522	HP EGS Overview
98305-90003	Learning HP EGS (one included w/98305A/R)
98305-90004	Understanding HP EGS (one included w/98305A/R)
98305-90005	HP EGS Syntax Reference (one included w/98305A/R)
98305-90007	HP EGS 2.0-to-2.1 Upgrade Note (one included w/98305-174x1)

98310A HP EGS Photoplotter and N/C Drill Tape Utilities

The 98310A utilities converts HP EGS PC board data files to Gerber photoplotter or Excellon NC (numerical control) drill format.

The 98310A utilities are companion software to HP 98305A HP EGS, and require its run-time environment. 98310A is not a stand-alone software application.

98310A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98310A	Photoploter-NC Drill	NOP	Yes	Yes	NA	NA	3.1

98310A Specification Summary

Data sheet (for complete specifications)	5953-4698
RAM required (total, stand-alone)	Same as 98305A
Minimum disc space required	Same as 98305A
Security	Codeword: requires 46084A ID module (not included) connected to mainframe

HP recommends that you use the same 46084A ID module for your 98310A utilities as used for your 98305A HP EGS software.

98310A/Series 300 Pascal Interfacing

The 98310A utilities may be linked and executed as normal application programs in the full Pascal 3.1 system. The 46084A ID module is still required.

98310A Ordering Information

98310A	HP EGS Photoplotter and N/C Drill utilities (includes certificate, manual set and software)
Option 042	Software on 5¼-in. flexible disc (internal interleave)
Option 044	Software on 3½-in. flexible disc (single-sided format)
98310R	Right-to-copy 98310A with sublicense (includes certificate) Prior or concurrent purchase of 98310A required
Option 100	Delete manuals (i.e. certificate only)
	HP 98310A Upgrades (uses existing codeword - includes one manual set)
98310-17420	HP 98310A 2.1 upgrade on 5¼-in. media
98310-17440	HP 98310A 2.1 upgrade on 3½-in. media
	HP 98310A Support Services
98310A+Q00	MUS for 98310A
98310A+S00	SMS for 98310A, software updates on same media as Pascal system if 98615C+x42 or 98615C+x44 services in effect
98310A+S42	SMS for 98310A, software updates on Option 042 media
98310A+S44	SMS for 98310A, software updates on Option 044 media
98310A+W00	Extended SMS for 98310R

98311A IGES Translator

The 98311A utilities convert HP EGS output data files to the NBS Initial Graphics Exchange Specification 1.0, aiding in transfer of HP EGS drawings to other CAD systems.

The 98311A utilities are companion software to HP 98305A HP EGS, and require its run-time environment. 98311A is not a stand-alone software application.

98311A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98311A	IGES Translator	NOP	Yes	Yes	NA	NA	3.1

98311A Specification Summary

Data sheet (for complete specifications)	5953-4698
RAM required (total, stand-alone) Minimum disc space required	Same as 98305A Same as 98305A
Supported peripherals:	Same as 98305A
Security	Codeword: requires 46084A ID module (not included) connected to mainframe

HP recommends that you use the same 46084A ID module for your 98311A utilities as used for your 98305A HP EGS software.

98311A/Series 300 Pascal Interfacing

The 98311A utilities may be linked and executed as normal application programs in the full Pascal 3.1 system. The 46084A ID module is still required.

98311A Ordering Information

98311A	IGES Translator (includes certificate, manual set and software)
Option 042	Software on 5¼-in. flexible disc (internal interleave)
Option 044	Software on 3½-in. flexible disc (single-sided format)
98311R	Right-to-copy 98311A with sublicense (includes certificate) Prior or concurrent purchase of 98311A required
Option 100	Delete manuals (i.e. certificate only)
	HP 98311A Upgrades (uses existing codeword - includes one manual set)
98311-17420	HP 98311A 2.1 upgrade on 5¼-in. media
98311-17440	HP 98311A 2.1 upgrade on 3½-in. media
	HP 98311A Support Services
98311A+Q00	MUS for 98311A
98311A+S00	SMS for 98311A, software updates on same media as Pascal system if 98615C+x42 or 98615C+x44 services in effect
98311A+S42	SMS for 98311A, software updates on Option 042 media
98311A+S44	SMS for 98311A, software updates on Option 044 media
98311A+W00	Extended SMS for 98311M/R

98515A HP-UX AXE

98515A is the HP-UX Application Execution Environment. It is the minimum (single-user) HP-UX system. There is no multi-user version of the AXE. The information in this section supplements that found in **Chapter 2**. The AXE includes the following:

- HP-UX kernel and all interface/device drivers except SRM and LAN.
- System installation, administration and backup tools.
- Full file system support, including LIF utilities
- Text editors (including *vi*), Windows/9000 and the Personal Applications Manager (PAM).
- The linker (*ld*).

98515A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98515A	HP-UX AXE	Rev. A	Yes	Yes	NA	5.1	NA

98515A Specification Summary

Data sheet (for complete specs.)	5953-9562
RAM required (total)	1.0 Mbytes
Minimum disc space required	10 Mbytes
Number of users	1

98515A Ordering Information

98515A	HP-UX AXE
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. flexible disc (double-sided format)
Option 100	Delete manuals
	HP-UX AXE Training
35128A	Introduction to HP-UX (5 days)
35128X	Introduction to HP-UX (10 students, on-site, 5 days)
Option 001	Additional student in 35128X (max. of 2)
35129A	HP-UX System Administration (3 days)
35129X	HP-UX System Administration (10 students, on-site, 3 days)
Option 001	Additional student in 35128X (max. of 2)
	HP-UX AXE Support Services
-	Information not available at time of publication
	HP-UX AXE Documentation
-	Information not available at time of publication

98517 Single-user HP-UX Programming Environment

98517A adds program development capability to the 98515A HP-UX AXE. This information supplements that found in **Chapter 2**. 98517A adds the following tools:

- *C* compiler and MC68000/68010 assembler
- *SCCS* Source Code Control System
- HP-UX libraries and additional utility commands
- Debuggers (*adb, cdb, fdb* and *pdb*)
- The *Starbase*, Windows/9000 and device I/O (*dil*) libraries
- *Uucp, uux* and *cu* networking
- *Nroff* text formatting

For multi-user applications, see 98597A.

98517A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98517A	HP-UX PE (single-user)	Rev. A	Yes	Yes	NA	5.1	NA

98517A Specification Summary

Data sheet (for complete specs.)	5953-9562
Prerequisite RAM required (additional) Minimum disc space required	98515A AXE 256 Kbytes 3 Mbytes plus an application-dependent user allowance
Number of users	1 (unchanged)

98517A Ordering Information

98517A Option 022 Option 045	HP-UX Single-user programming environment Software on ¼-in. cartridge tape Software on 3½-in. double-sided flexible discs
	HP-UX Training
35130A	*C* Programming language (5 days)
35130X Option 001	*C* Programming language (10 students, on-site, 5 days) Additional student in 35128X (max. of 2)
	HP-UX 5.1 Support Services
-	Information not available at time of publication
	HP-UX 5.1 Documentation
-	Information not available at time of publication

98518A HP-UX FORTRAN 77 Compiler

98518A is the single-user version of the FORTRAN77 Compiler. Refer to 98598A (multi-user) for product information.

98519A HP Pascal Compiler

98519A is the single-user version of the 98599A compiler. Refer to 98599A (multi-user) for product information.

98520A DGL/AGP Graphics Library

98520A is the single-user version of the 98600A library. Refer to 98600A (multi-user) for product information.

98542A Video Board

The 98542A is a 512×400×1 medium resolution monochromatic video board for the Series 300 computers. It consumes one system slot. It is functionally identical to the built-in video capability of the Model 310 computer. Much of this discussion therefore also applies to the video output of the 98561-66511 and -66512 processor boards of the Model 310.

This card is normally used with the Model 320, but can also be used with a Model 310 that does not have the built-in video capability (98561A Option 003).

The 98542A is compatible with the 35731A/B 12-in. monitor and the 35721A/B/C 14-in. monitor. It is also compatible with the 98546A compatibility video interface. The 98542A is user-installable.

98542A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98542A	512×400×1 video	Rev. A	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98542A	512×400×1 video	4.0	via *Starbase*	5.0	3.1

98542A Specification Summary

Data sheet (for complete specs.)	5953-9572
Refresh rate	60 Hz non-interlaced
Memory planes	1
Frame buffer size	1024 Horizontal × 512 Vertical
Displayed buffer size	1024 Horizontal × 400 Vertical
Effective graphics resolution	512 × 400
Default alpha resolution	26 lines × 80 columns
Default alpha character cell	9 × 12 in 10 × 15 pixels
Character sets	ROMAN8 (KANA8 downloaded by system)
CPU pixel write speed	60K pixels/sec. (Model 310), 120K pixels/sec. (320)
Hardware pixel write	1.0 M pixels/sec. horiz., 0.28 M pixels/sec. vert.
Window move speed	11.2 M pixels/sec.
Scrolling speed	16.9 M pixels/sec.
Screen erase	36 ms

The 98542A has 1024×112×1 pixels of off-screen buffer. All buffer pixels are vertically rectangular. For graphics use, they are always paired to form square pixels. For alpha use, the individual pixels may be used to provide higher definition characters, as in the ROM font.

98542A System Board Characteristics

Product Number	Description	System Slots	I/O Provided	Select Codes	Cables Included
98542A	512×400×1 video	1	Video(1)	NA	2.4m

The control space and frame buffer of the 98542A are at 0x560000 and 0x200000 hexadecimal, respectively. This conflicts with the the 98543/44/45A video boards and the 98561-66511/12 built-in video output (unless disabled). It may conflict with the 98287A (98700H) interface.

98542A/Series 300 Interfacing

There are no switches on the 98542A. The video output is a phono jack. This output connects to the 35721/31 monitor via the supplied cable, or to the input of the 98546A compatibility interface via the short BNC-to-BNC coax cable supplied with that interface.

The 98542A and 35721/31 monitors are compatible with the 46082A/B HP-HIL/RGB 15/30m extensions except for the connectors. You will need one pair of male-RCA-phono to BNC-female adaptors, available at most retail electronic supplies stores. Only one of the three BNC-to-BNC cables of the 46082 kit is used in this case.

98542A/Series 300 BASIC Interfacing

Typical device specifier	`CRT` (or 6)
Binaries required	CRTB (and LEX for KANA8)
Binaries optional	GRAPH, GRAPHX
Programming required	None

98542A/Series 300 HP-UX Interfacing

Drivers required	`console, graphics`
Block-mode major number	NA
Character-mode major number	0 (alpha), 12 (graphics)
DGL handler (via *Starbase*)	`D0056`
Starbase handler	`/usr/lib/libdd3001.a`
Windows/9000 support	Yes

98542A/Series 300 HP-UX Driver Minor Number (both drivers)

Bits	**23-16**	**15-12**	**11-8**	**7-0**
Fields	Not Used	Not Used	Position	Not Used
Values (hex)	00	0 0	0 (98546A not present) 1 (98546A also present)	00

Typical *mknod*s for 98542A (or Model 310 built-in) in a system with a 98546A.

```
# mknod /dev/console    c  0 0x000000
# mknod /dev/graphics   c 12 0x000100
```

98542A/Series 300 Pascal Interfacing

Default volume	`CONSOLE:` (or 1)
Modules required	CRTC
Modules optional	GRAPHICS (any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

98542A Ordering Information

98542A	Medium resolution monochromatic video board
46082A	15m HP-HIL/RGB extension
46082B	30m HP-HIL/RGB extension
5958-4342	Installation note (one included w/98542A)
98561-61603	2.4m RCA phono -to- RCA phono video cable

98543A Color Video Board

The 98543A is a 512×400×4 medium resolution color video board for the Series 300 computers. It consumes one system slot. The 98543A is standard in the 98581A bundled system.

The 98543A is compatible with the 35741A/B 12-in. monitor. The green output (only) is compatible with the 98546A video compatibility interface and the 35721 and 35731 monitors. The 98543A is user-installable.

98543A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98543A	512×400×4 video	Rev. A	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98543A	512×400×4 video	4.0	via *Starbase*	5.0	3.1

98543A Specification Summary

Data sheet (for complete specs.)	5953-9572
Refresh rate	60 Hz non-interlaced
Colors available	16 of 16777216
Frame buffer size	1024 Horizontal × 512 Vertical
Displayed buffer size	1024 Horizontal × 400 Vertical
Effective graphics resolution	512 × 400
Default alpha resolution	26 lines × 80 columns
Default alpha character cell	9 × 12 in 10 × 15 pixels
Character sets	ROMAN8 (KANA8 downloaded by system)
CPU pixel write speed	60K pixels/sec. (Model 310), 120K pixels/sec. (320)
Hardware pixel write	1.0 M pixels/sec. horiz., 0.28 M pixels/sec. vert.
Window move speed	11.2 M pixels/sec.
Scrolling speed	16.9 M pixels/sec.
Screen erase	36 ms

The 98543A has 1024×112 pixels of off-screen buffer (4 bits per pixel). All buffer pixels are vertically rectangular. For graphics use, they are always paired to form square pixels. For alpha use, the individual pixels may be used to provide higher definition characters, as in the ROM font.

98543A System Board Characteristics

Product Number	Description	System Slots	I/O Provided	Select Codes	Cables Included
98543A	512×400×4 video	1	Video(3)	NA	3×2.4m

The control space and frame buffer of the 98543A are at 0x560000 and 0x200000 hexadecimal, respectively. This conflicts with the the 98542/44/45A video boards and the 98561-66511/12 built-in video output (unless disabled). It may conflict with the 98287A (98700H) interface.

98543A/Series 300 Interfacing

There are no switches on the 98543A. The video output is three female BNC connectors (RGB). This output connects to the 35741 monitor via the supplied cables. The "green" output can also connect to the input of the 98546A compatibility interface via the short coax BNC-to-BNC cable supplied with that interface.

The 98543A board and 35741 monitor are compatible with the 46081A HP-HIL and 46082A/B HP-HIL/RGB 15/30m extensions; however, the audio circuit requires a 1252-1112 male RCA phono to female subminiature phone adaptor (not included).

98543A/Series 300 BASIC Interfacing

Typical device specifier	`CRT` (or 6)
Binaries required	CRTB (and LEX if KANA8 used)
Binaries optional	GRAPH, GRAPHX
Programming required	None

98543A/Series 300 HP-UX Interfacing

Drivers required	`console, graphics`
Block-mode major number	NA
Character-mode major number	0 (alpha), 12 (graphics)
DGL handler (via *Starbase*)	`D0056`
Starbase handler	`/usr/lib/libdd300l.a`
Windows/9000 support	Yes

98543A/Series 300 HP-UX Driver Minor Number (both drivers)

Bits	**23-16**	**15-12**	**11-8**	**7-0**
Fields	Not Used	Not Used	Position	Not Used
Values (hex)	00	0 0	0 (98546A not present) 1 (98546A also present)	00

Typical *mknod*s for 98543A with 98546A present.

```
# mknod /dev/console   c  0 0x000000
# mknod /dev/graphics  c 12 0x000100
```

98543A/Series 300 Pascal Interfacing

Default volume	`CONSOLE:` (or 1)
Modules required	CRTC
Modules optional	GRAPHICS (any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

98543A Ordering Information

98543A	Medium resolution monochromatic video board
1252-1112	Male RCA phono to female subminiature phone adaptor
46081A	2.4m HP-HIL extension (with audio)
46082A	15m HP-HIL/RGB extension (with audio)
46082B	30m HP-HIL/RGB extension (with audio)
5958-4342	Installation note (one included w/98543A)
8120-3616	2.4m BNC-to-BNC video cables (3 included w/98543A)

98544A Video Board

The 98544A is a 1024×768×1 high resolution monochromatic video board for the Series 300 computers. It is standard in the 98582A bundled system. It consumes one system slot.

The 98544A is compatible with the 98781A 17-in. monitor. The 98544A is user-installable.

98544A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98544A	1024×768×1 video	Rev. A	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98544A	1024×768×1 video	4.0	via *Starbase*	5.0	3.1

98544A Specification Summary

Data sheet (for complete specs.)	5953-9572
Refresh rate	60 Hz non-interlaced
Memory planes	1
Frame buffer size	1024 Horizontal × 1024 Vertical
Displayed buffer size	1024 Horizontal × 768 Vertical
Effective graphics resolution	1024 × 768
Default alpha resolution	48 lines × 128 columns
Default alpha character cell	6 × 10 in 8 × 16 pixels
Character sets	ROMAN8, KANA8
CPU pixel write speed	60K pixels/sec. (Model 310), 120K pixels/sec. (320)
Hardware pixel write	1.0 M pixels/sec. horiz., 0.28 M pixels/sec. vert.
Window move speed	20 M pixels/sec.
Scrolling speed	30 M pixels/sec.
Screen erase	40 ms

The 98544A has 1024×256×1 pixels of off-screen buffer.

98544A System Board Characteristics

Product Number	Description	System Slots	I/O Provided	Select Codes	Cables Included
98544A	1024×768×1 video	1	Video(1)	NA	2.4m control 2.4m video

The control space and frame buffer of the 98544A are at 0x560000 and 0x200000 hexadecimal, respectively. This conflicts with the the 98542/43/45A video boards and the 98561-66511/12 built-in video output (unless disabled). It may conflict with the 98287A (98700H) interface.

98544A/Series 300 Interfacing

There are no switches on the 98544A. The video output is a female BNC connector. There is also a "control" output with a 9-pin connector. This output carries sync, audio (beeper), HP-HIL and AC power control. The HP-HIL circuit is merely 3.0m of cable which connects the mainframe HP-HIL port to an HP-HIL (••) jack on the 98781A monitor. It is not an active extension.

The audio circuit connects the audio output of the mainframe to a speaker in the 98781A monitor. The 98544A audio cable has a subminiature phone plug at the computer end, and therefore includes a phone jack-to- RCA phone plug adaptor for use with the RCA jack of the 98561-66530 human interface card and the 98561-66511, -66512 and 66513 processor boards.

Due to the 9-pin control connector, the 46082A/B HP-HIL/RGB 15m and 30m extensions cannot be used with the 98544A or 98781A.

98544A/Series 300 BASIC Interfacing

Typical device specifier	`CRT` (or 6)
Binaries required	CRTB
Binaries optional	GRAPH, GRAPHX
Programming required	None

98544A/Series 300 HP-UX Interfacing

Drivers required	`console, graphics`
Block-mode major number	NA
Character-mode major number	0 (alpha), 12 (graphics)
DGL handler (via *Starbase*)	`D0056`
Starbase handler	`/usr/lib/libdd300h.a`
Windows/9000 support	Yes

98544A/Series 300 HP-UX Driver Minor Number (both drivers)

Bits	**23-16**	**15-12**	**11-8**	**7-0**
Fields	Not Used	Not Used	Position	Not Used
Values (hex)	00	0 0	0 (98546A not present) 1 (98546A also present)	00

Typical *mknod*s for 98544A with no 98546A present.

```
# mknod /dev/console   c  0 0x000000
# mknod /dev/graphics  c 12 0x000000
```

98544A/Series 300 Pascal Interfacing

Default volume	`CONSOLE:` (or 1)
Modules required	CRTC
Modules optional	GRAPHICS (Any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

98544A Ordering Information

98544A	Medium resolution monochromatic video board
09920-61602	2.4m control cable (one included w/98544A)
5958-4342	Installation note (one included w/98544A)
8120-4483	2.4m BNC-to-BNC video cable (one included w/98544A)
1252-1112	Adaptor: subminature female phone to male RCA phono (one included w/98544A)

98545A Color Video Board

The 98545A is a 1024×768×4 high resolution color video board for the Series 300 computers. It is standard in the 98583A bundled system. It consumes one system slot.

The 98545A is compatible with the 98782A 19-in. monitor. The 98545A is user-installable.

98545A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98545A	1024×768×4 video	Rev. A	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98545A	1024×768×4 video	4.0	via *Starbase*	5.0	3.1

98545A Specification Summary

Data sheet (for complete specs.)	5953-9572
Refresh rate	60 Hz non-interlaced
Colors available	16 of 16777216
Frame buffer size	1024 Vertical × 1024 Horizontal
Displayed buffer size	1024 Vertical × 768 Horizontal
Effective graphics resolution	1024 × 768
Default alpha resolution	48 lines × 128 columns
Default alpha character cell	6 × 10 in 8 × 16 pixels
Character sets	ROMAN8, KANA8
CPU pixel write speed	60K pixels/sec. (Model 310), 120K pixels/sec. (320)
Hardware pixel write	1.0 M pixels/sec. horiz., 0.28 M pixels/sec. vert.
Window move speed	20 M pixels/sec.
Scrolling speed	30 M pixels/sec.
Screen erase	40 ms

The 98545A has 1024×256 pixels of off-screen buffer (4 bits per pixel).

98545A System Board Characteristics

Product Number	Description	System Slots	I/O Provided	Select Codes	Cables Included
98545A	1024×768×4 video	1	Video(3)	NA	2.4m RGB

The control space and frame buffer of the 98545A are at 0x560000 and 0x200000 hexadecimal, respectively. This conflicts with the the 98542/43/44A video boards and the 98561-66511/12 built-in video output (unless disabled). It may conflict with the 98287A (98700H) interface.

98545A/Series 300 Interfacing

There are no switches on the 98545A. The video output is three female BNC connectors. The supplied video cable is three BNC-to-BNC cables in a single molded assembly.

The 98782A monitor has no speaker. Audio output must be provided by a 46081A or 46082A/B HP-HIL extension. These extensions have audio cables terminated in subminiature phono plugs. The 98545A includes an adaptor to mate with the RCA phone jack of the computer's audio output.

The 98545A and 98782A are compatible with the 46082A/B 15/30m HP-HIL/RGB extensions. The 15/30m RGB cables in the 46082 replace the 2.4m cable supplied with the 98545A.

98545A/Series 300 BASIC Interfacing

Typical device specifier	`CRT` (or 6)
Binaries required	CRTB
Binaries optional	GRAPH, GRAPHX
Programming required	None

98545A/Series 300 HP-UX Interfacing

Drivers required	`console, graphics`
Block-mode major number	NA
Character-mode major number	0 (alpha), 12 (graphics)
DGL handler (via *Starbase*)	`D0056`
Starbase handler	`/usr/lib/libdd300h.a`
Windows/9000 support	Yes

98545A/Series 300 HP-UX Driver Minor Number (both drivers)

Bits	**23-16**	**15-12**	**11-8**	**7-0**
Fields	Not Used	Not Used	Position	Not Used
Values (hex)	00	0 0	0 (98546A not present) 1 (98546A also present)	00

Typical *mknod*s for 98545A with no 98546A present.

```
# mknod /dev/console   c  0 0x000000
# mknod /dev/graphics  c 12 0x000000
```

98545A/Series 300 Pascal Interfacing

Default volume	`CONSOLE:` (or 1)
Modules required	CRTC
Modules optional	GRAPHICS (any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

98545A Ordering Information

98545A	High resolution color video board
46082A	15m HP-HIL/RGB extension
46082B	30m HP-HIL/RGB extension
5958-4342	Installation note (one included w/98545A)
98700-61603	2.4m RGB video cable (one included w/98545A)
1252-1112	Female submin. phone to male RCA phono adaptor (one included w/98545A)

98546A Video Compatibility Interface

The 98546A is a medium resolution monochromatic video interface card set with separate alpha and graphics planes. It is intended for use with applications software which requires a high degree of compatibility with Series 200 displays. It provides the same 25×80 alpha display and 512×390×1 graphics display as the 98204B interface of the Model 217 computer, or the built-in display of the Model 236 computer. The output of the 98546A is compatible with the 35721A/B/C, 35731A/B and 35741A/B monitors.

The 98546A compatibility interface is designed for use in Series 300 computers which *also* have a bit-mapped video output; either a built-in or 98542A medium resolution monochromatic or 98543A medium resolution color video board. The video output of the bit-mapped display (green gun, if color) is routed through the compatibility card. There, a relay on the compatibility card switches the CRT monitor between compatibility video output and bit-mapped video output, under software control.

The 98546A may be used as the sole monitor in a system without bit-mapped video. It may also be used in a system with high-resolution bit-mapped video, if a separate 35721/31/41 medium resolution monitor is provided for the 98546A. The 98546A is included in the 98580A Option 008 and 98581A Option 008 bundled systems. The 98546A is user-installable.

98546A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98546A	512×390×1 video	Rev. A	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98546A	512×390×1 video	4.0	5.0	5.1	3.1

98546A Specification Summary

Data sheet (for complete specifications)	5953-9572
Refresh rate	60 Hz non-interlaced, 50 Hz user-selectable
Memory planes	1 alpha, 1 graphics (not bit-mapped)
Graphics frame buffer size	512 Horizontal × 390 Vertical
Displayed buffer size	512 Horizontal × 390 Vertical
Effective graphics resolution	512 × 390
Alpha resolution	25 lines × 80 columns
Alpha character cell	7 × 9 with ½-dot shifting
Character sets	ROMAN8, KANA8, Roman Extension
Maximum 98546As per CPU	1
Vector writing speed	1200 vectors/sec.

98546A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98546A	Video compatibility i/f	2	Yes	None	Yes	No

The 98546A consists of an I/O card (alpha) and an accessory card (graphics) connected by a very short ribbon cable. The card set must occupy adjacent slots. The alpha card may be used without the graphics card, although there is no option to delete the graphics card at time of order.

The alpha and graphics control spaces of the 98546A are at 0x510000 and 0x530000 hexadecimal, respectively. These addresses are unique among supported Series 300 video cards, boards and interfaces. They do conflict with the unsupported 98204A/B video interfaces.

98546A/Series 300 Interfacing

The 98546A has two BNC connectors: Video In and Video Out. The Video Out connects either;

- to the 35721/31 monitor's Video In, using the supplied BNC-to-RCA cable, or;
- to the GREEN input of the 35741 monitor, using one of the BNC-to-BNC cables supplied with the 98543A video board.

If the computer also has a medium resolution video board, its connections are:

- The 98542A or built-in monochrome video output connects to the Video In of the 98546A, using the short RCA-to-BNC cable supplied.
- The 98543A GREEN video output connects to the Video In of the 98546A, using the short BNC-to-BNC cable supplied. The RED and BLUE video outputs connect normally to the 35741 monitor.

98546A Switches	Sample Configuration	Comments
50/60 Hz	Your choice	Suggest matching local AC power frequency to eliminate 10 Hz beat flicker
Char Select	ROMAN8	If software expects 98204B (9817) character set, or does not use European/Japanese characters
	ASCII/Katakana	If software expects 9836A character set (ASCII+Roman Extension/Katakana)

The 98546A and 35721/31/41 monitors are compatible with the 46082A/B HP-HIL 15/30m extensions except for the connectors. For the 35721/31 monochromatic monitors, you will need one male-RCA-phono to BNC-female adaptor, available at most retail electronic supplies stores. Only one of the three BNC-to-BNC cables of the 46082 kit is used in this case.

The 98546A is not compatible with the 82912/13A monitors, nor with the 98627A color video interface.

98546A/Series 300 BASIC Interfacing

The search priority for the default alpha and graphics displays is described in the **Alphanumeric Displays and Terminals** section of **Chapter 4**.

Alpha output from BASIC and BASIC programs is sent solely to the current alpha device. To make the 98546A the alpha device (assuming it is not the default display), you must execute the CONTROL statement shown below. This statement also affects which interface is the default graphics device (i.e. "CRT" or "1" used as device specifier).

Graphics output is sent solely to the current PLOTTER IS device. You can plot to the 98546A at all times by using device specifier "3". The prior graphics display is erased by PLOTTER IS under some circumstances. Check the BASIC manuals.

Typical device specifier	`CRT` (or 3)
Binaries required	CRTA
	CRTB (if bit-mapped video present)
Binaries optional	GRAPH, GRAPHX
Programming required	`CONTROL CRT,21;1` to enable 98546A
	`CONTROL CRT,21;0` to disable 98546A

98546A/Series 300 HP-UX Interfacing

The console search priority is described in the **Alphanumeric Displays and Terminals** section of **Chapter 4**. Unlike BASIC, if the 98546A is not the default alpha display, you *cannot* make it the alpha display under program control. You can access it as a graphics device regardless of whether or not it is the console.

Drivers required	`console`
	`graphics` (if bit-mapped graphics present)
Block-mode major number	NA
Character-mode major number	0 (alpha)
	12 (graphics)
DGL handler	`D0042`
Starbase handler	`/usr/lib/libdd9836A.a`
Windows/9000 support	None

98546A/Series 300 HP-UX Driver Minor Number (both drivers)

Bits	**23-16**	**15-12**	**11-8**	**7-0**
Fields	Not Used	Not Used	Position	Not Used
Values (hex)	00	0	0	00

Typical *mknod*s for 98546A.

```
# mknod /dev/console    c  0 0x000000
# mknod /dev/graphics   c 12 0x000000
```

98546A/Series 300 Pascal Interfacing

Default volume	`CONSOLE:` (or 1)
Modules required	CRT
	CRTC (if bit-mapped graphics present)
Modules optional	GRAPHICS (any Series 300)
	FGRAPHICS (Model 310 with 98635A)
	FGRAPH20 (Model 320)

98546A Ordering Information

98546A	Compatibility video interface
46082A	15m HP-HIL/RGB extension
46082B	30m HP-HIL/RGB extension
5061-6533	2.4m BNC-to-RCA video cable (one included w/98546A)
8120-4703	0.6m BNC-to-RCA video cable (one included w/98546A)
8120-4704	2.4m RCA-to-RCA video cable (one included w/98546A)
8120-4712	0.6m BNC-to-BNC video cable (one included w/98546A)
98546-90600	Installation note (one included w/98546A)

98561 Series 300 Computer Mainframes

The 98561 is the Series 300 computer mainframe. The 98561A is the Model 310 and the 98561B is the Model 320. Both are based on the same 5-unit high 325mm-wide HP *Design-Plus* enclosure and power supply. The most commonly required information about configuring these computers is provided in **Chapter 3**. This section is primarily a cross-reference to the various components of these mainframes, and a summary of less frequently needed technical details.

If you are a software developer or OEM, note that the only difference between the Model 310 and 320 computers is the boards and cards plugged into them. If you order a 98561A, 98257A 1.0 Mbyte RAM card and 98243A upgrade kit, you can, within a few minutes, configure the 98561 box to most* base 310 or 320 configurations. With the appropriate assortment of 98540-series video boards/cards, you can configure any of the bundled systems as well.

98561/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98561A	Model 310 computer	Rev. A	Yes	NA	4.0	5.0	3.1
98561B	Model 320 computer	Rev. A	98243A	Yes	4.0	5.0	3.1

98561A/B Specification Summary

Parameter	Model 310 (98561A)	Model 320 (98561B)
Data sheet	5953-9572	Same
Dimensions Weight	127mmH, 325mmW, 376mmD 10 kg (12 kg shipping)	Same Same
Processor board	Refer to 98561-66512, or -66511 (Option 002), or -66513 (Option 003)	Refer to 98561-66519
Boot ROM	Refer to 5061-6538	Same
Cache RAM	None	Refer to 98561-66519
Standard RAM	Refer to 98561-66512 and 98257A	Refer to 98257A
HP-DIO backplane	Refer to **Chapter 2** and 98242A	Refer to **Chapter 2**
Built-in HP-IB	Refer to 98561-66512 and 98624A	Refer to 98561-66530 and 98624A
Built-in HP-HIL	Refer to 98561-66512 and 98561-66530	Refer to 98561-66530
Built-in RS-232C	Refer to 98561-66512 and 98644A	Refer to 98561-66530 and 98644A
Built-in video output	Refer to 98561-66512 and 98542A	None

* You can simulate the 98561A Option 003 (no video) via a switch, and the 98561A Option 004 (no DIO backplane) by removing the backplane. The only base configuration you cannot directly simulate with the components listed is 98561A Option 002 (the 512 Kbyte reduced RAM configuration).

98561A/B Specification Summary, continued...

Parameter	Model 310 (98561A)	Model 320 (98561B)
Built-in audio output	Refer to 98561-66512	Refer to 98561-66530
Floating point hardware	Optional: see 98635A	Refer to 98561-66519
AC voltage required AC frequency tolerance AC power required	85 to 129, 187 to 250 Vac 49 to 66 Hz 250 Watts, max.	

98561A/B Ordering Information

98561A	Model 310 base system
Option 002	Reduce standard RAM to 512 Kbytes (do not order w/Option 003)
Option 003	Delete built-in 512×390×1 video (do not order w/Option 002)
Option 004	Delete HP-DIO backplane
98561B	Model 320 base system
98580A	Model 310 medium resolution monochromatic bundled system
Option 002	Reduce standard RAM to 512 Kbytes
Option 008	Add 98546A video compatibility interface
98581A	Model 310 medium resolution color bundled system
Option 008	Add 98546A video compatibility interface
98582A	Model 320 high resolution monochromatic bundled system
98583A	Model 320 high resolution color bundled system
5957-7953	Series 300 Memory configuration wheel (one included w/Series 300 systems)
98561-90000	Installation Reference manual (half-size, one included w/Series 300 systems)
98561-90030	Series 300 Service Information manual
98561-90039	Series 300 Service Handbook pages
98567A	19-in. EIA rack adaptor for 35731 monitor (requires 15.75-in. rack space)
98567B	19-in. EIA rack adaptor for 35741 monitor (requires 15.75-in. rack space)
98568A	8-slot HP-DIO expander
98569A	19-in. EIA rack adaptor for Series 300 computer and 98568A (requires 7-in. rack space for computer, +5¼-in. for expander)
98644-67950	25-pin RS-232C test connector (Model 310 only)

98561-66511 Processor Board

The 98561-66511 is an optional processor board of the Model 310 computer (98561A Option 002, 98580A Option 002). It is identical to the 98561-66512 processor board described next, except that it has only 512 Kbytes of on-board parity RAM.

If you are planning to upgrade to 1.0 Mbytes later by adding two 98256A RAM cards, consider the following:

- The performance of on-board RAM is significantly (about 50%) higher than plug-in RAM (98256A and 98257A cards). A Model 310 with a 98561-66512 or -66513 processor board will run faster than a machine with a 98561-66511 board and two 98256A (256 Kbyte) RAM cards.
- The built-in RAM auto-configures itself to the highest available 512 Kbyte address space. If you use the Memory Configuration Wheel supplied with the computer and set the wheel to 524114 bytes at Step 2, the built-in RAM configures itself to high RAM ("above plug-in"). To configure the built-in RAM to "below plug-in", set the wheel to "0" at Step 2. *Note* - If you configure the built-in RAM "below" plug-in RAM, the plug-in RAM must end on a 512 Kbyte boundary (only possible if two 98256A cards are present). If you leave a "hole" for the built-in RAM, it must also be 512 Kbytes in size.
- The 98256A cards have no error detection (parity). The 98257A card does have parity.

98561-66511/Series300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98561-66511	68010 processor	Rev. A	Yes	NA	4.0	5.0	3.1
	512 Kbytes RAM	Rev. A	Yes	NA	4.0	5.0	3.1
	HP-IB interface	Rev. A	Yes	NA	4.0	5.0	3.1
	HP-HIL interface	Rev. A	Yes	NA	4.0	5.0	3.1
	RS-232C interface	Rev. A	Yes	NA	4.0	5.0	3.1
	512×400×1 video	Rev. A	Yes	NA	4.0	5.0	3.1
	Audio output	Rev. A	Yes	NA	4.0	5.0	3.1
	Real-time clock	Rev. A	Yes	NA	4.0	5.0	3.1
	Memory Management Unit	Rev. A	Yes	NA	NA	5.0	NA

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98561-66512	512×400×1 video	4.0	via *Starbase*	5.0	3.1

98561-66512 Processor Board

The 98561-66512 is the standard processor board of the Model 310 computer. The 98561-66512 contains: a 10 MHz MC68010 CPU, 1.0 Mbytes RAM, standard speed HP-IB interface, RS-232C interface, HP-HIL interface, 512×400×1 bit-mapped video interface, audio output and battery-backed real-time clock. It is a Series 300 *system* board and occupies one system slot.

98561-66512/Series300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98561-66512	68010 processor	Rev. A	Yes	NA	4.0	5.0	3.1
	1.0 Mbytes RAM	Rev. A	Yes	NA	4.0	5.0	3.1
	HP-IB interface	Rev. A	Yes	NA	4.0	5.0	3.1
	HP-HIL interface	Rev. A	Yes	NA	4.0	5.0	3.1
	RS-232C interface	Rev. A	Yes	NA	4.0	5.0	3.1
	512×400×1 video	Rev. A	Yes	NA	4.0	5.0	3.1
	Audio output	Rev. A	Yes	NA	4.0	5.0	3.1
	Real-time clock	Rev. A	Yes	NA	4.0	5.0	3.1
	Memory Management Unit	Rev. A	Yes	NA	NA	5.0	NA

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98561-66512	512×400×1 video	4.0	via *Starbase*	5.0	3.1

98561-66512 Specification Summary

Data sheet (for complete specs.)	5953-9572
Processor type and clock	MC 68010, 10 MHz
Internal architecture	32 bit data & address buses
Data bus to on-board RAM	16-bit
to HP-DIO backplane	16-bit
Instruction types	56
Major data types	5
Addressing modes	14
Interrupt levels	6 maskable, 1 non-maskable
Addressable RAM	7.5 Mbytes physical, 16 Mbytes virtual
RAM supplied	1 048 576 bytes, parity (identical to 98257A except no wait states)
Video output	Identical to 98542A (including addresses) except that it is built-in and does not require a second system card.
HP-IB Interface	Identical to 98624A except: Has interrupt on PPOLL response, and; Select code is fixed at 7.
HP-HIL Interface	Identical to HP-HIL of 98561-66530 card; supplies 1000 mA
RS-232C Interface	Identical to 98644A except: Does not have 98626A-compatibility jumper; Interrupt level is fixed at 3; Select code is fixed at 9.

98561-66512 Specifications, continued...

Audio output	250 mW output at 8 ohms
Number of generators	3 tone, 1 noise (all programmable)
Frequency range (tone)	81.46 Hz to 83.3 KHz
Resolution	5 octaves approximate chromatic scale
Dynamic range	30 dB
Duration	0.01 to 2.55 seconds per tone
Clock resolution	10 milliseconds
Accuracy	±5 seconds per day
Battery type	Lithium, non-rechargable
Battery life	1 year, user-replacable
Match interrupt	Time of day (0.00 to 84600.00 sec.)
Delay interrupt	10 ms to 1.94 days
Cyclical interrupt	10 ms to 1.94 days
System timer	4 μs, resolution to 25ppm

98561-66512 System Board Characteristics

Product Number	Description	System Slots	I/O Provided	Select Codes	Cables Included
98561-66512	Model 310 processor	1	Video(1)	-	2.4m
			HP-IB	7	1.0m
			HP-HIL	-	0.8-3.0m
			RS-232C	9	None
			Audio	-	2.4m

98561-66512 built-in HP-IB Characteristics

SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C1...C5, E2

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
98561-66512	HP-IB interface	1	20 or 21	1	N or H	0.0m	1.0m

Built-in HP-IB interfaces have a fixed bus address of 21 (if system controller) and 20 (not system controller).

98561-66512 HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Supplied	Device Type	Cable Included
98561-66512	HP-HIL interface	1	1	1000mA	Controller	0.8-3.0m

98561-66512/Series300 Interfacing

This section discusses only those features unique to the 98561-66511, -66512 and -66513 cards.

Processor Switches	Sample Configuration	Comments
RAM address (no switches)	Above plug-in Below plug-in	BASIC, HP-UX Pascal
Video output	Enabled	Unless 98542A, 98543A, 98544A or 98545A board, or "internal" 98287A card present
HP-IB	System Controller	
Keyboard	Local	Unless console is terminal (HP-UX)
Modem lines	Disabled	Unless peripheral requires "enabled"

- The built-in RAM is accessed without wait states, and is therefore approximately 50% faster than plug-in RAM. If the computer also has plug-in RAM (98256A, 98257A), the built-in RAM should be addressed such that that it is the most frequently accessed.

  The built-in RAM auto-configures itself to the highest available 1.0 Mbyte address space. If you use the Memory Configuration Wheel supplied with the computer and set it to 1048402 bytes at step 2, the built-in RAM configures itself to high RAM ("above plug-in"). To configure the built-in RAM to "below plug-in", set the wheel to "0" at Step 2. *Note* - If you configure the built-in RAM "below" plug-in RAM, the plug-in RAM must end on a 1.0 Mbyte boundary. If you leave a "hole" for the built-in RAM, it must also be 1.0 Mbytes in size.

- The built-in video interface is functionally identical to the 98542A video board. Refer to 98542A in this appendix for details. You must disable this built-in video interface (via a switch) to install a 98542...45A video board or 98287A configured for "internal" control space.
- The built-in HP-IB is functionally identical to the 98624A HP-IB card except that it supports "interrupt on parallel poll response", which provides significantly lower overhead when used with discs and tapes in the HP-UX operating system. Refer to 98624A in this appendix for a discussion of the other capabilities of the built-in HP-IB.
- The built-in HP-HIL interface is identical to that supplied with the 98561-66530 human interface card. Refer to 98561-66530 in this appendix.
- The built-in RS-232C interface is identical to the 98644A, except as noted the specifications. Refer to 98644A for cabling information.
- The built-in real-time clock is identical to that supplied with the 98561-66530 human interface card. Refer to 98561-66530 in this appendix.
- The audio output is identical to that provided by the 98561-66530 card. Refer to that card for details.

98561-66513 Processor Board

The 98561-66513 is an optional processor board of the Model 310 computer (98561A Option 003). It is identical to the 98561-66512 processor board described previously, except that the -66513 board has no video output.

Series 300/98561-66513 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98561-66512	68010 processor	Rev. A	Yes	NA	4.0	5.0	3.1
	1.0 Mbytes RAM	Rev. A	Yes	NA	4.0	5.0	3.1
	HP-IB interface	Rev. A	Yes	NA	4.0	5.0	3.1
	HP-HIL interface	Rev. A	Yes	NA	4.0	5.0	3.1
	RS-232C interface	Rev. A	Yes	NA	4.0	5.0	3.1
	Audio output	Rev. A	Yes	NA	4.0	5.0	3.1
	Real-time clock	Rev. A	Yes	NA	4.0	5.0	3.1
	Memory Management	Rev. A	Yes	NA	NA	5.0	NA

98561-66519 Processor Board

The 98561-66519 is the standard processor board of the Model 320 computer. The 98561-66519 contains: a 16.6 MHz MC68020 CPU, a 12.5 MHz MC68881 floating-point co-processor and 16 Kbytes (4K × 32-bit words) of high-speed cache RAM. The 68020 CPU itself also has a 256-byte instruction cache. The 98561-66519 is a Series 300 *system* board and occupies one system slot.

The 98561-66519 includes no I/O or video circuitry. However, all supported configurations also include the 98561-66530 human interface card, which supplies audio, HP-IB, HP-HIL, RS-232C and battery-backed real-time clock.

The 98561-66519 is part of the 98243A Model 310 to Model 320 upgrade kit.

98561-66519/Series300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98561-66519	68020-based processor	Rev. A	Upgrade	Yes	4.0	5.0	3.1
	16 Kbyte cache	Rev. A	Upgrade	Yes	4.0	5.0	3.1
	MC68881 co-processor	Rev. A	Upgrade	Yes	4.0	5.0	3.1
	Memory management	Rev. A	Upgrade	Yes	NA	5.0	NA

98561-66519 Specification Summary

Data sheet (for complete specifications)	5953-9572
Processor type and clock speed	MC 68020, 16.6 MHz
Floating point hardware	MC 68881, 12.5 MHz
High-speed cache RAM	16 Kbytes
Internal architecture	32 bit data & address buses
Data bus to on-board RAM	32-bit
to HP-DIO backplane	16-bit
Instruction types	100
Major data types	7
Addressing modes	18
Interrupt levels (maskable, non-maskable)	6, 1
Addressable RAM (physical, virtual)	7.5 Mbytes, 4 Gbytes*
RAM supplied	None
System timer	4 μs, resolution to 25ppm
I/O built-in	None

98561-66519 System Board Characteristics

Product Number	Description	System Slots	I/O Provided	Select Codes	Cables Included
98561-66519	Model 320 processor	1	None	-	None

98561-66519/Series300 Interfacing

The 98561-66519 has no cabling.

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* The maximum addressable virtual memory (VM) is limited by the total (not individual) disc storage on your system. Only the HP-UX operating system supports VM.

98561-66519/Series 300 BASIC Interfacing
BASIC enables both internal and external cache by default. You can disable external cache with a `CONTROL 32,1;0` statement. and internal cache with a `CONTROL 32,3;0`.

BASIC transparently selects the MC68881 coprocessor for floating point computations. You can disable the MC68881 with a `CONTROL 32,2;0` statement.

Typical device specifier	32 (control/status register)
Binaries required	None
Binaries optional	None
Programming required	None

98561-66519/Series 300 HP-UX Interfacing
HP-UX always executes with cache enabled. HP-UX 5.0 includes a floating point library optimized for the MC68881 *(/lib/lib881.a)*. The HP-UX compilers do not presently generate MC68881-optimized code.

To include the library, the following steps are required for each language:

C	`cc <filename>.c -l881` at compile time
FORTRAN77	`f77 <filename>.c -l881` at compile time
Pascal	`pc <filname>.c -l881` at compile time

98635A/Series 300 Pascal Interfacing
Pascal enables internal and external cache by default.

The standard "COMPILER" does not generate the MC68881-optimized code. The alternate "COMPILER20" can generate MC68881 (only) optimized code if there is a `$FLOAT_HDW ON$` or `$FLOAT_HDW TEST$` directive in the source code code. There are also three versions of the DGL graphics library:
"GRAPHICS" was compiled with "$FLOAT_HDW TEST$ and the standard COMPILER
"FGRAPHICS" was compiled with "$FLOAT_HDW ON$ and the standard COMPILER
"FGRAPH20" was compiled with "$FLOAT_HDW ON$ and COMPILER20

98561-66530 Human Interface Card

The 98561-66530 is an interface combining HP-IB, HP-HIL, RS-232C, audio and time-of-day clock functions on one HP-DIO card. This card is supplied in all Model 320 computers and as part of the 98243A processor upgrade kit. This section describes the following about the features and support of this card:

- The HP-IB capability is sufficiently similar to the 98624A interface card that only the differences are described here. These differences also apply to the built-in HP-IB of the Model 310.
- The HP-HIL interface and HP-HIL cabling rules are completely described here. This discussion also covers the HP-HIL interface of the Model 310.
- The RS-232C capability is sufficiently similar to the 98644A interface card that only the differences are described here.
- The audio output is described here. This discussion also covers Model 310 audio.
- The clock is described here. This discussion also covers the clock of the Model 310.

98561-66530/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98561-66530	Human interface card	Rev. A	98243A	Yes	4.0	5.0	3.1
	HP-IB interface	Rev. A	NA	Yes	4.0	5.0	3.1
	HP-HIL interface	Rev. A	NA	Yes	4.0	5.0	3.1
	RS-232C interface	Rev. A	NA	Yes	4.0	5.0	3.1
	Audio output	Rev. A	NA	Yes	4.0	5.0	3.1
	Real-time clock	Rev. A	NA	Yes	4.0	5.0	3.1

98561-66530 Specification Summary

Data sheet (for complete specifications)	5953-9572
Maximum 98561-66530 cards/system	1
HP-IB Interface	Identical to 98624A except: Has interrupt on PPOLL response, and; Select code is fixed at 7.
HP-HIL Interface	Supplies 1.0A
RS-232C Interface	Identical to 98644A except: Has 9-pin, rather than 25-pin connector; Does not have line OCD1 (DRS, RS-232C line "CH"); Does not have 98626A-compatibility jumper; Interrupt level is fixed at 3; Select code is fixed at 9.
Audio output	250 mW output at 8 ohms
Number of generators	3 tone, 1 noise (all programmable)
Frequency range (tone)	81.46 Hz to 83.3 KHz
Resolution	5 octaves approximate chromatic scale
Dynamic range	30 dB
Duration	0.01 to 2.55 seconds per tone

98561-66530 Specification Summary, continued...

Clock resolution	10 milliseconds
Accuracy	±5 seconds per day
Battery type	Lithium, non-rechargable
Battery life	1 year, user-replacable
Match interrupt	Time of day (0.00 to 84600.00 sec.)
Delay interrupt	10 ms to 1.94 days
Cyclical interrupt	10 ms to 1.94 days
System timer	4 μs, resolution to 25ppm

98561-66530 HP-DIO Characteristics

This card is not compatible with the Model 310 (except as part of an upgrade) due to address conflicts with the built-in interfaces on the 98561-66511, -66512 and -66513 boards.

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98561-66530	Human interface card	1	1	7, 9: Fixed	Yes	Yes

98561-66530 HP-IB Characteristics

SH1, AH1, T6, TE5, L4, LE3, SR1, RL1, PP1, DC1, DT1, C1, C2, C3, C4, C5, E1.

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
98561-66530	HP-IB interface	1	0...30	1	N or H	0.0m	None

Built-in HP-IB interfaces have a fixed bus address of 21 (if system controller) and 20 (not system controller).

98561-66530 HP-HIL Characteristics

Product Number	Description	HP-HIL Addresses	HP-HIL Jacks	DC Power Supplied	Device Type	Cable Included
98561-66530	HP-HIL interface	1	1	1000mA	Controller	None

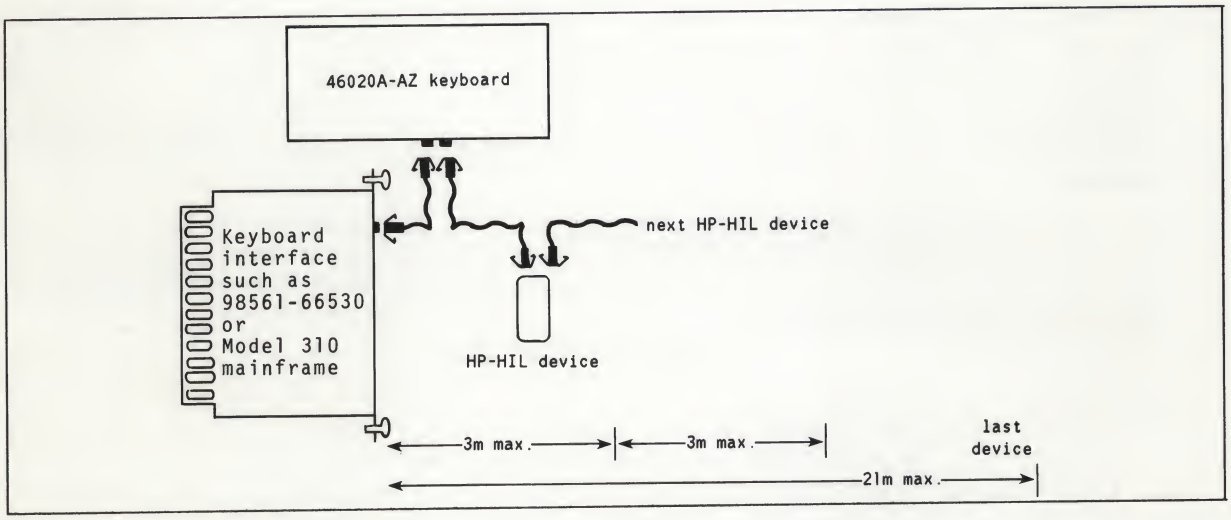
98561-66530/Series300 Interfacing

Refer to 98624A for HP-IB cabling. The clock has no external connections. The audio output is a female RCA phono jack.

98561-66530 Switches	Sample Configuration	Comments
HP-IB	System Controller	
Keyboard	Local	Unless console is terminal (HP-UX)
Modem lines	Disabled	Unless peripheral requires "enabled"

98561-66530 HP-HIL Interfacing and HP-HIL Cabling Rules

This discussion also covers the built-in HP-HIL interface of the Model 310 computer and all HP-HIL peripherals.



The limitations on HP-HIL devices are:

- Plug each SDL (serial data link) connector *only* into an identically marked jack. HP-HIL hosts (such as Series 300 mainframes and the 2393A terminal), usually have a single HP-HIL jack, marked "••". All separate HP-HIL cables have differing polarized SDL connectors on each end. One end is marked "••" and the other "•". All HP-HIL devices with detachable cables have both a "•" and "••" jack. The "•" jack is "towards host" and the "••" jack is "downstream".

> **CAUTION**
>
> *Do not* force the connectors. *Do* observe cable/jack markings. Although the SDL connectors and jacks are keyed as well as marked, it is possible to force a "••" connector into a "•" jack, and vice-versa. If power is applied to the host in this configuration, one or more HP-HIL peripherals on the link will have their link interface circuitry destroyed.

- The total power consumed by all devices on the link must be 12 Watts or less (1000mA at 12 Vdc). The power required by each HP-HIL device is listed under the heading "**HP-HIL Characteristics**" in the device's entry in this appendix. Series 300 mainframes have ample power for all configurations of up to three devices, and all configurations of up to seven devices not including the 46085A control dial box.

  Power supplied by the HP 150-II (45850A) and 2393A terminal is lower than 1000mA. Consult those sections of this appendix for information.

- The total number of *addressable* devices must be seven (7) or less (eight including the HP-HIL interface itself). Most devices use one address. Exceptions are the extensions, which have no address, and the 46085A control dial module, which has three. Device addressing data is found with the power data.

- The maximum cabling has "per-device" and "total length" limits. The first is 2.4m per device (other than the 46082A/B remote extensions). A tested exception to this is using a 46020A keyboard with its 3.0m coiled cable connected to the 3.0m HP-HIL circuit of the 98781A monitor.

The total length limit is 21m (48.6m if a 46082 remote extension is used). You may use multiple 46080/81A extensions or a *single* 46082 remote extension.

- It is possible to have more than one of the same device type on the link. In the case of keyboards, the operating system establishes its single internal key-location-to-character code conversion table based on the language ID of the *first* keyboard-type device encountered. An application using a 92916A bar code reader (which emulates a keyboard) should have the reader configured "downstream" of the keyboard. An application using two (different) keyboards (such as text translation) must perform a secondary conversion on characters sent from the second keyboard.
- HP-HIL devices auto-configure their addresses based on their position on the link. When directly addressing HP-HIL device in HP-UX, you must not remove any but the last device from the link, or the */dev* special files will no longer correctly designate the desired device(s) downstream of the removed device.

Available HP-HIL Cables

Part Number	Description
46080-61601	2.4m, flat, male-to-male
46083-61601	0.4m, flat, male-to-male
46020-60001	0.8-to-3.0m, coiled, male-to-male

98561-66530 RS-232C Interfacing

This interface is functionally identical to the 98644A, except as noted in the specifications table. They require different cables, however. The 98561-66530 built-in RS-232 has a 9-pin female connector (identical to that on the 45710/11A *Portable* and *Portable Plus)*. This interface can provide the following host connections:

Interface Connector	Interface Cable	Con-nector	Con-nector	Cable/Device(s)	Con-nector	Provides Host Connection Type
9F	-	-	-	-	-	DIR9(F)
9F	92221M*	25M	-	-	-	DTE(M)
9F	92221P*	25M	-	-	-	DIR25(M)
9F	92221M*	25M	25F	13232U	25F	DCE(F)
9F	92221M*	25M	25F	Modem~Modem	25F	DCE(F)

"DIR9(F)" and "DIR25(M)" are not EIA-standard notation. These designations indicate that pins 2 and 3 are reversed (compared to normal DTE(M) and DCE(F) wiring) and that these connection types should only be used where a direct-connect 3-wire circuit (transmit, receive and ground) is acceptable. All other RS-232C lines, especially the modem control lines, may not be usefully connected (if connected at all) from the peripheral to the interface when "DIR" cabling is used.

* Early versions of these HP110 cables have English, rather than metric threaded screws. Use only cables with metric screws.

98561-66530 RS-232C Pinouts

9-Pin Number	92221M Pin No.	EIA Circuit Designator	V.24 Circuit Designator	Signal Description
1	20	CD	108/2	DTR: Data Terminal Ready
2	2	BA	103	TXD: Transmitted Data
3	3	BB	104	RXD: Received Data
4	4	CA	105	RTS: Request To Send
5	5	CB	106	CTS: Clear To Send
6	6	CC	107	DSR: Data Set Ready
7	7	AB	102	GND: Signal ground
8	8	CF	109	CD: Carrier Detect
9	22	CE	125	RI: Ring Indicator

98561-66530 and 98561-66511/12/13 Audio Output

The audio volume level is adjusted under software control only. Not all peripherals have RCA phono jack audio input. The following table shows the cabling required for audio. The audio cable is included in each of these configurations; the adaptor may not be. "smp" stands for "subminiature phone".

Audio Output	Adaptor Required	Con-nector	Audio Cable	Con-nector	Con-nector	Peripheral w/Speaker
RCA-F	None	RCA-M	8120-4483	RCA-M	RCA-F	35731, 35741
RCA-F	1252-1112	smp-M	09920-61602	smp-M	smp-F	98781A
RCA-F	1252-1112	smp-M	46081-61601	smp-M	smp-F	46081A
RCA-F	1252-1112	smp-M	46082-61601	smp-M	smp-F	46082A/B

The 1252-1112 is included with the 98544A and 98545A high resolution video boards. It is *not* included with any other products and must typically be ordered separately when using a 46081A or 46082A/B HP-HIL extension with any medium resolution display.

98561-66530 and 98561-66511/12/13 Real-time Clock

If you plan to execute HP-UX and either BASIC or Pascal on the same system, note that:

- The HP-UX *date(1)* command and *stime(2)* instrinsic set the clock to Greenwich Mean Time (GMT). The *date* command reports local time by applying a correction factor based on the value of your "TZ" environment variable.
- BASIC and Pascal set the clock to LOCAL time, and assume that it is so set.

98561-66530/Series 300 BASIC Interfacing

Typical device specifier	7 (for HP-IB) KBD (or 2, for HP-HIL) 9 (for RS-232C)
Binaries required	Refer to connected devices
Binaries optional	CLOCK, IO, also refer to connected devices
Programming required	Refer to connected devices

The 98561-66530 interface must be present for BASIC to function.

98561-66530/Series 300 HP-UX Interfacing

Time-of-day resolution is 20 ms in HP-UX.

Drivers required	Refer to connected devices
Block-mode major number	Refer to connected devices
Character-mode major number	Refer to connected devices

98561-66530/Series 300 Pascal Interfacing

Default volume	Refer to connected devices
Modules required	A804XDVR
Modules optional	BAT, CLOCK
	also refer to connected devices

98567A/B Rack Adaptors

The 98567A is an EIA 19-in. rack mount adaptor for the 35731 12-in. monitor. The 98567B is an EIA 19-in. rack mount adaptor for the 35741 12-in. monitor. Both rack adaptors require 15.75-in. of vertical rack space.

The 98567A/B are not compatible with the 2392A or 2394A terminals.

98567A/B Ordering Information

98567A	EIA rack adaptor for 35731 monitor
98567B	EIA rack adaptor for 35741 monitor
5958-4344	Installation Note (included w/98567A/B)
5958-4351	Installation Note color supplement (included w/98567B)

98568A Series 300 Bus Expander

The 98568A is a passive HP-DIO bus expander for Series 300 computers. It is supplied in a five-unit high, 325mm wide HP *Design-Plus* enclosure virtually identical to a Series 300 mainframe. The 98568A adds 8 DIO slots (4 I/O). It adds *no* system slots. Unlike the 9888A Series 200/300 bus expander, the 98568A imposes no additional restrictions on the type or number of DIO cards that may be installed. The 98568A is user-installable.

98568A/Series 300 Support Summary

Series 300 computers support a maximum of one 98568A expander.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98568A	DIO bus expander	Rev. A	Yes	Yes	4.0	5.0	3.1

98568A Specification Summary

Data sheet (for complete specifications)	5953-9572
Dimensions	127mmH, 325mmW, 376mmD
Weight	10 kg (12 kg shipping)
HP-DIO slots added (total slots)	8
HP-DIO "I/O" slots added	4
System slots added	0
Performance degradation	None
AC voltage required	85 to 129, 187 to 250 Vac
AC frequency tolerance	49 to 66 Hz
AC power required	250 Watts, max.

98568A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98568A	Effect on mainframe	0	NA	NA	Note	Opt.
	Effect on system	+8	NA	Any	Note	Opt.

Note - A 9888A can connect to either the Series 300 mainframe or the 98568A expander.

98568A/Series 300 Interfacing

There are no switches on the 98568A. The 98568A connects to the Series 300 mainframe (98561) by mechanically attaching to the top of the 98561. A ribbon cable between the enclosures connects the DIO backplanes. A new upper case for the 98561 is included with the 98568A to provide a path for the cable.

Unlike the 9888A expander, the 98568A does not consume an I/O (or accessory) slot in the mainframe.

98568A Ordering Information

98568A	Series 300 bus expander
98568-90600	Installation Note (one included w/98568A)

98569A Rack Adaptor

The 98569A is an EIA 19-in. rack mount adaptor for the Series 300 computer mainframes and 98568A expanders. It is also suitable for other 325mm-wide HP *Design-Plus* components which are up to 325mm deep and either 5- or 10-units high.

The 98569A kit consists of a 7-in.-high 19-in.-wide winged support shelf for the 5-unit high computer (or other device). It includes brackets and rails.

The kit also includes a 5¼-in.-high pair of wings for the 98568A expander (or other device). The expander merely sits atop the computer, and the wings cover the space on either side.

98569A Ordering Information

98569A	EIA rack adaptor for 5- or 10-unit high devices.
5958-4343	Installation Note (included w/98569A)

98597A Multi-user HP-UX Programming Environment

98597A is the minimum multi-user HP-UX environment. This information supplements that found in **Chapter 2.** 98597A includes

- HP-UX kernel and all interface/device drivers except SRM and LAN.
- System installation, administration and backup tools.
- Full file system support, including LIF utilities
- Text editors (including *vi*), Windows/9000 and the Personal Applications Manager (PAM).
- The linker (*ld*), *C* compiler and MC68000/68010 assembler
- *SCCS* Source Code Control System
- HP-UX libraries and additional utility commands
- Debuggers (*adb, cdb, fdb* and *pdb*)
- The *Starbase,* Windows/9000 and device I/O (*dil*) libraries
- *Uucp, uux* and *cu* networking
- *Nroff* text formatting

98597A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98597A	HP-UX PE (multi-user)	Rev. A	Yes	Yes	NA	5.1	NA

98597A Specification Summary

Data sheet (for complete specs.)	5953-9562
Prerequisite	None
RAM required (additional)	256 Kbytes/user
Minimum disc space required	3 Mbytes plus an application-dependent per-user allowance
Number of users	16 (4...8 recommended)

98597A Ordering Information

98597A	HP-UX Multi-user programming environment
Option 003	Upgrade from previously purchased 98517A
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
	HP-UX Training
35130A	*C* Programming language (5 days)
35130X	*C* Programming language (10 students, on-site, 5 days)
Option 001	Additional student in 35128X (max. of 2)
	98597A Support Services
-	Information not available at time of publication
	98597A Documentation
-	Information not available at time of publication

98598A and 98518A FORTRAN 77 Compiler

98518A (single-user) and 98598A (multi-user) provide the FORTRAN77 compiler for the 98517A and 98597A programming environments (respectively). This information supplements that found in **Chapter 2.** Both products include only the compiler. The *fdb* debugger and run-time libraries are included in the programming environment products.

98518/98A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98518A	FORTRAN77 (single-user)	Rev. A	Yes	Yes	NA	5.1	NA
98598A	FORTRAN77 (multi-user)	Rev. A	Yes	Yes	NA	5.1	NA

98518/98A Specification Summary

Data sheet (for complete specs.)	5953-9562
Prerequisite	98518A: 98515A AXE and 98517A PE 98598A: 98597A PE
RAM required (additional)	<none>
Minimum disc space required	2 Mbytes plus an application-dependent per-user allowance

The 98598A compiler will also execute (single-user) in a single-user system. The 98518A compiler executes *only* in a single-user system. The code produced by either compiler can execute in any Series 200 or 300 HP-UX system of revision 5.0 or later.

98518/98A Ordering Information

98518A	HP-UX Single-user FORTRAN77 compiler
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
98598A	HP-UX Multi-user FORTRAN77 compiler
Option 003	Upgrade from previously purchased 98518A
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
	98518/98A Support Services
-	Information not available at time of publication
	98518/98A Documentation
-	Information not available at time of publication

98599A and 98519A HP Pascal Compiler

98519A (single-user) and 98599A (multi-user) provide the HP Pascal compiler for the 98517A and 98597A programming environments (respectively). This information supplements that found in **Chapter 2.** Both products include only the compiler. The *fdb* debugger and run-time libraries are included in the programming environment products.

98519/99A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
98518A	HP Pascal (single-user)	Rev. A	Yes	Yes	NA	5.1	NA
98598A	HP Pascal (multi-user)	Rev. A	Yes	Yes	NA	5.1	NA

98519/99A Specification Summary

Data sheet (for complete specs.)	5953-9562
Prerequisite	98519A: 98515A AXE and 98517A PE 98599A: 98597A PE
RAM required (additional)	<none>
Minimum disc space required	2 Mbytes plus an application-dependent per-user allowance

The 98599A compiler will also execute (single-user) in a single-user system. The 98519A compiler executes *only* in a single-user system. The code produced by either compiler can execute in any Series 200 or 300 HP-UX system of revision 5.0 or later.

98519/99A Ordering Information

98518A	HP-UX Single-user HP Pascal compiler
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
98598A	HP-UX Multi-user HP Pascal compiler
Option 003	Upgrade from previously purchased 98518A
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
	98519/99A Support Services
-	Information not available at time of publication
	98519/99A Documentation
-	Information not available at time of publication

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98600A and 98520A DGL/AGP Library

98520A (single-user) and 98600A (multi-user) provide the Device-independent Graphics Library (DGL) and the Advanced Graphics Package (AGP) for the 98517A and 98597A programming environments (respectively). This information supplements that found in **Chapter 2.**

DGL is recommended for use with existing graphics software or for support of certain older peripherals not presently supported by *Starbase*, such as the 98627A color video interface. DGL includes a handler which provides access to all peripherals supported by *Starbase*.

AGP is recommended for use with existing graphics software or where new software requires the picture segmentation and 3-D transformations presently available only in AGP.

98520/600A-Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98520A	DGL/AGP (single-user)	Rev. A	Yes	Yes	NA	5.1	NA
98600A	DGL/AGP (multi-user)	Rev. A	Yes	Yes	NA	5.1	NA

98520/600A Specification Summary

Data sheet (for complete specs.)	5953-9562
Prerequisite	98520A: 98515A AXE and 98517A PE 98600A: 98597A PE
RAM required (additional)	<none>
Minimum disc space required	2 Mbytes plus an application-dependent per-user allowance

The 98600A library will also execute (single-user) in a single-user system. The 98518A library executes *only* in a single-user system.

98520/600A Ordering Information

98520A	HP-UX Single-user DGL/AGP graphics library
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
98600A	HP-UX Multi-user DGL/AGP graphics library
Option 003	Upgrade from previously purchased 98520A
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
98683X	DGL Skeleton Handler
Option 022	Software on ¼-in. cartridge tape
Option 045	Software on 3½-in. double-sided flexible discs
	HP-UX DGL/AGP Support Services
-	Information not available at time of publication
	HP-UX DGL/AGP Documentation
-	Information not available at time of publication

98603A ROM BASIC 4.0

BASIC 4.0 is discussed at length in **Chapter 2**. The section summarizes that information and adds less frequently needed data.

The ROM BASIC card includes the BASIC system plus all binaries (except two). The SRM, DCOMM and KNB2_0 binaries and all BASIC utilities are supplied on disc.

The RAM version of BASIC 4.0 is product number 98613B and is described separately.

98603A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98603A	BASIC 4.0	Rev. A	Yes	Yes	4.0	NA	NA

98603A Specification Summary

Data sheet (for complete specifications)	5953-9560
RAM required (total)	59 Kbytes
Disc space used (as supplied)	<800 Kbytes
Binaries not in ROM	SRM, DCOMM, KNB2_0

98603A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98603A	ROM BASIC 4.0	1	No	None	No	NA

98603A Ordering Information

98603A	ROM BASIC 4.0
Option 001*	Upgrade from ROM BASIC 1.0, 2.0 or 2.1
Option 042	Software supplied on 5¼-in. flexible discs
Option 044	Software supplied on 3½-in. single-sided flexible discs
Option 045	Software supplied on 3½-in. double-sided flexible discs
	Compiled Subprogram Utilities (CSUB)
	(also requires Pascal 3.1 Language System)
98613-11240	CSUB supplied on 5¼-in. flexible discs
98613-11440	CSUB supplied on 3½-in. single-sided flexible discs
98613-11540	CSUB supplied on 3½-in. double-sided flexible discs
98613-17240	CSUB 3.0-to-4.0 upgrade: 5¼-in. flexible discs
98613-17440	CSUB 3.0-to-4.0 upgrade: 3½-in. single-sided flexible discs
98613-17540	CSUB 3.0-to-4.0 upgrade: 3½-in. double-sided flexible discs

* The invoice or sales order number of the original order must be referenced on the upgrade order.

ROM BASIC 4.0 Ordering Information, continued...

	BASIC Training
98510B	Series 200 BASIC Operating and Programming (5 days)
98510X	On-site 98510B (5 days, 8 students)
Option 001	Additional student for 98510X (4 max.)
	BASIC 4.0 Support Services
98603A+H42	RCS for 98603A, software updates on 5¼-in. flexible discs
98603A+H44	RCS for 98603A, software updates on 3½-in. single-sided flex. discs
98603A+H45	RCS for 98603A, software updates on 3½-in. double-sided flex. discs
98603A+Q00	MUS for 98603A
98603A+S42	SMS for 98603A, software updates on 5¼-in. flexible discs
98603A+S44	SMS for 98603A, software updates on 3½-in. single-sided flex. discs
98603A+S45	SMS for 98603A, software updates on 3½-in. double-sided flex. discs
98603A+V00	RCS coverage for additional system, with right to copy updates
98603A+V42	Additional RCS, software updates on 5¼-in. flexible discs
98603A+V44	Additional RCS, software updates on 3½-in. single-sided flex. discs
98603A+V45	Additional RCS, software updates on 3½-in. double-sided flex. discs
98603A+W00	Right to copy SMS updates for additional system
98603A+W42	Additional SMS, software updates on 5¼-in. flexible discs
98603A+W44	Additional SMS, software updates on 3½-in. single-sided flex. discs
98603A+W45	Additional SMS, software updates on 3½-in. double-sided flex. discs
	BASIC 4.0 Documentation (refer to 9282-0000 for binders)
98613-87901	BASIC 4.0 Manual Kit (includes 98613-90011, -90021, -90031, -90041, -90051, -90061, -90071, -90082, -90090, -90091, -90662 and six binders.
98613-90011	BASIC 4.0 Programming Techniques
98613-90021	BASIC 4.0 Interfacing Techniques
98613-90031	BASIC 4.0 Graphics Techniques
98613-90041	BASIC 4.0 User's Guide
98613-90051	BASIC 4.0 Language Reference
98613-90061	BASIC 4.0 Condensed Reference
98613-90071	BASIC 4.0 Documentation Guide & Master Index
98613-90082	BASIC 4.0 Software/Manual Catalog
98613-90090	CSUB 4.0 Preparation Manual
98613-90091	BASIC 4.0 Utilities Library Manual
98613-90662	BASIC 4.0 Keyboard Overlays Installation Note

98613B RAM BASIC 4.0

BASIC 4.0 is discussed at length in **Chapter 2**. The section summarizes that information and adds less frequently needed data.

The ROM version of BASIC 4.0 is product number 98603A and is described separately.

98613B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98613B	BASIC 4.0	Rev. A	Yes	Yes	4.0	NA	NA

98613B Specification Summary

Data sheet (for complete specifications)	5953-9560
RAM required (total)	512 Kbytes
Disc space used (as supplied)	1.14 Mbytes

Native Language Support
BASIC 4.0 provides collating (LEXICAL ORDER IS...) and case folding (LWC$, UPC$) for ASCII and ROMAN8 French, German, Spanish and Swedish.

Symbolic names and file names may include printable extension characters. Error messages are presently provided only in American English.

BASIC configures the system for either Roman or Katakana operation at boot-up based on the keyboard connected.

98613B Ordering Information

98613B	RAM BASIC 4.0
Option 001*	Upgrade from BASIC 1.0, 2.0, 2.1 or 3.0
Option 042	Software supplied on 5¼-in. flexible discs
Option 044	Software supplied on 3½-in. single-sided flexible discs
Option 045	Software supplied on 3½-in. double-sided flexible discs
98613R	Right-to-copy 98613B RAM BASIC 4.0 (includes manual set) (requires prior or concurrent purchase of 98613B without Option 001 or purchase of the 98580A bundled system, which includes BASIC)
Option 001*	Upgrade from previous version of 98613R or 98611R.
Option 100	Delete manuals
	Compiled Subprogram Utilities (CSUB) (also requires Pascal 3.1 Language System)
98613-11240	CSUB supplied on 5¼-in. flexible discs
98613-11440	CSUB supplied on 3½-in. single-sided flexible discs
98613-11540	CSUB supplied on 3½-in. double-sided flexible discs
98613-17240	CSUB 3.0-to-4.0 upgrade: 5¼-in. flexible discs
98613-17440	CSUB 3.0-to-4.0 upgrade: 3½-in. single-sided flexible discs
98613-17540	CSUB 3.0-to-4.0 upgrade: 3½-in. double-sided flexible discs

* The invoice or sales order number of the original order must be referenced on the upgrade order.

BASIC 4.0 Ordering Information, continued...

	BASIC Training
98510B	Series 200 BASIC Operating and Programming (5 days)
98510X	On-site 98510B (5 days, 8 students)
Option 001	Additional student for 98510X (4 max.)
	BASIC 4.0 Support Services
98613B+H42	RCS for 98613B, software updates on 5¼-in. flexible discs
98613B+H44	RCS for 98613B, software updates on 3½-in. single-sided flex. discs
98613B+H45	RCS for 98613B, software updates on 3½-in. double-sided flex. discs
98613B+Q00	MUS for 98613B
98613B+S42	SMS for 98613B, software updates on 5¼-in. flexible discs
98613B+S44	SMS for 98613B, software updates on 3½-in. single-sided flex. discs
98613B+S45	SMS for 98613B, software updates on 3½-in. double-sided flex. discs
98613B+V00	RCS coverage for additional system, with right to copy updates
98613B+V42	Additional RCS, software updates on 5¼-in. flexible discs
98613B+V44	Additional RCS, software updates on 3½-in. single-sided flex. discs
98613B+V45	Additional RCS, software updates on 3½-in. double-sided flex. discs
98613B+W00	Right to copy SMS updates for additional system
98613B+W42	Additional SMS, software updates on 5¼-in. flexible discs
98613B+W44	Additional SMS, software updates on 3½-in. single-sided flex. discs
98613B+W45	Additional SMS, software updates on 3½-in. double-sided flex. discs
	BASIC 4.0 Documentation (refer to 9282-000 for binders)
98613-87901	BASIC 4.0 Manual Kit (includes 98613-90011, -90021, -90031, -90041, -90051, -90061, -90071, -90082, -90090, -90091, -90662 and six binders.
98546-84001 and 98546-84002	BASIC 4.0 keyboard overlays (for 46020-series keyboards only)
98613-90011	BASIC 4.0 Programming Techniques
98613-90021	BASIC 4.0 Interfacing Techniques
98613-90031	BASIC 4.0 Graphics Techniques
98613-90041	BASIC 4.0 User's Guide
98613-90051	BASIC 4.0 Language Reference
98613-90061	BASIC 4.0 Condensed Reference
98613-90071	BASIC 4.0 Documentation Guide & Master Index
98613-90082	BASIC 4.0 Software/Manual Catalog
98613-90090	CSUB 4.0 Preparation Manual
98613-90091	BASIC 4.0 Utilities Library Manual
98613-90662	BASIC 4.0 Keyboard Overlays Installation Note

98613-11x40 CSUB 4.0

(Compiled Subprogram Utility)

CSUB 4.0 supports the creation of Pascal (or assembly) language subprograms in the Pascal 3.1 or 3.0 system that are callable from BASIC 4.0. The CSUB product includes the following:

98613-90090 - the CSUB 4.0 manual.

CSUBDECL - a Pascal module containing BASIC-compatible type declarations.

CSUBLIB - a Pascal library containing the entry/exit support code, selected BASIC 4.0 entrypoints, string and arithmetic routines, HEAP/COM routines, and simple I/O routines.

BUILDC - a Pascal program that builds the header and jump files which make the CSUB BASIC-callable.

GENC - a Pascal stream file that generates the final BASIC-loadable CSUB. It invokes two additional supplied programs: RELDATA and BUILDLIF.

You can do the following in a CSUB:

- Pass and return parameters of BASIC types: INTEGER, REAL and STRING. The parameters may be passed or in COM and may be ARRAYs.
- Output STRINGs, INTEGERs and REALs to the PRINTER IS device. Read STRINGs, INTEGERs and REALs from the KBD device.
- Use Pascal sets, global space and heap (including *new, mark, release,* and *dispose.*)
- Use *try/recover* and *escape* to the BASIC error processing routine to report a user-specified ERROR number.

Things you *cannot* do include:

- Enter the Pascal debugger from BASIC.
- Perform any I/O (including file I/O) other than PRINTER IS and KBD.
- Service I/O interrupts.
- Link the Pascal procedure libraries to the CSUB.
- Use procedure variables.

The CSUB 4.0 product requires a Pascal 3.0 or 3.1 development system and generates CSUBs compatible *only* with BASIC 4.0. Any Pascal 3.1 system which can execute the filer, editor and compiler has enough RAM. CSUB 4.0 is supplied on a single flexible disc.

To generate CSUBs for BASIC 3.0 requires the CSUB 3.0 utility (98613-10x40) and Pascal 3.0; BASIC 2.0/2.1 requires the CSUB 2.0 utility (09800-10x40) and Pascal 2.0 or 2.1. In general, you must have a Series 200 system to generate CSUBs for BASIC systems earlier than 4.0.

98613-11x40/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98613-11x40	CSUB 4.0	NOP	Yes	Yes	4.0	NA	3.1

98613-11x40/Series 300 BASIC Interfacing

CSUBs are appended to BASIC programs with the LOADSUB statement and are invoked by using the name of the desired CSUB as a BASIC statement. The following example lines of BASIC show loading of a CSUB library ("MY_CSUBS") and calling a standard deviation CSUB ("Std_dev") within that library.

```
10      LOADSUB ALL FROM "MY_CSUBS"
            ...
190     Std_dev(Val(*),High,Mean,St_dev)
            ...
```

98613-11x40 Ordering Information

98613-11240	CSUB 4.0 supplied on 5¼-in. flexible disc
98613-11440	CSUB 4.0 supplied on 3½-in. single-sided flexible disc
98613-11540	CSUB 4.0 supplied on 3½-in. double-sided flexible disc
98613-17240	CSUB 3.0-to-4.0 upgrade: 5¼-in. flexible disc
98613-17440	CSUB 3.0-to-4.0 upgrade: 3½-in. single-sided flexible disc
98613-17540	CSUB 3.0-to-4.0 upgrade: 3½-in. double-sided flexible disc
98613-90090	CSUB 4.0 Utility manual (full-size, one included w/CSUB 4.0)

* The invoice or sales order number of the original order must be referenced on the upgrade order.

98615C Pascal 3.1

Pascal 3.1 is discussed at length in **Chapter 2**. The section summarizes that information and adds less frequently needed data.

The 98615E product includes only a right-to-execute certificate and confers the right to make one copy of the 98615C system except the compilers and the assembler.

98615C/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98615C	Pascal 3.1	Rev. A	Yes	Yes	CSUB	NA	3.1

98615C Specification Summary

Data sheet (for complete specifications)	5953-9561
RAM required (total)	512 Kbytes
Disc space used (as supplied)	2.7 Mbytes

Native Language Support

The Pascal pred and ord functions operate strictly on the numeric value of each byte of text data, although the data may be 8-bit. This provides a sorting comparison operation typically suited only for ASCII. Pascal provides no case-folding utilities.

Symbolic names and file names may include printable extension characters.

Error messages are presently provided only in American English.

Pascal configures the system for either Roman or Katakana operation at boot-up based on the keyboard connected.

98615C/Series 300 BASIC Interfacing

Pascal subprograms are callable from BASIC programs if compiled using the 98613-11x40 CSUB utility.

98615C Ordering Information

98615C	RAM Pascal 3.1
Option 001*	Upgrade from Pascal 1.0, 2.0, 2.1 or 3.0
Option 042	Software supplied on 5¼-in. flexible discs
Option 044	Software supplied on 3½-in. single-sided flexible discs
Option 045	Software supplied on 3½-in. double-sided flexible discs
98615E	Right-to-execute Pascal 3.1
Option A01	99 additional certificates (at a discount)
98613R	Right-to-copy 98615C RAM Pascal 3.1 (includes manual set) (requires prior or concurrent purchase of 98615C without Option 001)
Option 001*	Upgrade from previous version of 98613R or 98611R.
Option 100	Delete manuals

* The invoice or sales order number of the original order must be referenced on the upgrade order.

Pascal 3.1 Ordering Information, continued...

	Compiled Subprogram Utilities (CSUB)
	(also requires BASIC 4.0 Language System)
98613-11240	CSUB supplied on 5¼-in. flexible discs
98613-11440	CSUB supplied on 3½-in. single-sided flexible discs
98613-11540	CSUB supplied on 3½-in. double-sided flexible discs
98613-17240	CSUB 4.0 upgrade: 5¼-in. flexible discs
98613-17440	CSUB 4.0 upgrade: 3½-in. single-sided flexible discs
98613-17540	CSUB 4.0 upgrade: 3½-in. double-sided flexible discs
	Pascal Training
98511B	Series 200 Pascal Operating and Programming (5 days)
98511X	On-site 98510B (5 days, 8 students)
Option 001	Additional student for 98510X (4 max.)
	Pascal 3.1 Support Services
98615C+H42	RCS for 98615C, software updates on 5¼-in. flexible discs
98615C+H44	RCS for 98615C, software updates on 3½-in. single-sided flex. discs
98615C+H45	RCS for 98615C, software updates on 3½-in. double-sided flex. discs
98615C+Q00	MUS for 98615C
98615C+S42	SMS for 98615C, software updates on 5¼-in. flexible discs
98615C+S44	SMS for 98615C, software updates on 3½-in. single-sided flex. discs
98615C+S45	SMS for 98615C, software updates on 3½-in. double-sided flex. discs
98615C+V00	RCS coverage for additional system, with right to copy updates
98615C+V42	Additional RCS, software updates on 5¼-in. flexible discs
98615C+V44	Additional RCS, software updates on 3½-in. single-sided flex. discs
98615C+V45	Additional RCS, software updates on 3½-in. double-sided flex. discs
98615C+W00	Right to copy SMS updates for additional system
98615C+W42	Additional SMS, software updates on 5¼-in. flexible discs
98615C+W44	Additional SMS, software updates on 3½-in. single-sided flex. discs
98615C+W45	Additional SMS, software updates on 3½-in. double-sided flex. discs
	Pascal 3.1 Documentation (refer to 9282-000 for binders)
98615-87902	Pascal 3.1 Manual Kit (includes 98615-90016, -90022, -90031, -90036, -90041, -90051, -90606, 09826-90073 and 6 binders)
09826-90072	*An Introduction to Programming and Problem Solving in Pascal* -
09826-90073	MC68000/68010 User's Manual (one included w/98615C/R)
	Schneider, Weingart and Perlman (one included w/98615C/R)
92233C*	*OH! Pascal!* - Cooper and Clancy
92234J*	*Software Tools In Pascal* - Kernighan and Plaugher
97082-90002*	*Programming in Pascal with HP Pascal* - Grogono
98613-90090*	CSUB 4.0 Preparation Manual
98615-90016	Pascal 3.1 Documentation Guide & Master Index (one included w/98615C/R)
98615-90022	Pascal 3.1 Workstation Manual (2 volumes) (one included w/98615C/R)
98615-90031	Pascal 3.1 Procedure Library (one included w/98615C/R)
98615-90036	Pascal 3.1 Graphics Techniques (one included w/98615C/R)
98615-90041	Pascal 3.1 User's Guide (one included w/98615C/R)
98615-90051	HP Pascal Language Reference (one included w/98615C/R)
98615-90606	MC68020 User's Manual (one included w/98615C/R)

* These manuals available separately.

98620A/B DMA card

The 98620A and 98620B DMA cards are two-channel Direct Memory Access controllers for Series 200 and 300 computers. They are "accessory"-style HP-DIO cards. The 98620A is no longer supplied, having been replaced by the fully compatible 98620B. The 98620B is user-installable.

98620/Series 300 Support Summary

Series 300 computers support a maximum of one DMA card.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98620A	DMA card	Rev. A	Yes	Yes	4.0	No	3.1
98620B	DMA card	Rev. A	Yes	Yes	4.0	5.0	3.1

Some peripherals require DMA (e.g. 7971A and 9885M/S).

98620B Specification Summary

98620A/B cards per system	1
DMA channels	2
Transfer types	word or byte
Maximum transfer block	65536 bytes
Maximum data rate	1.2 Mbytes/sec/channel

The data transfer rate without DMA is generally limited to less than 50 Kbytes/sec.

98620 HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98620A	DMA card	1	No	None	No	NA
98620B	DMA card	1	No	None	No	NA

The 98620A/B is compatible with the 98568A expander.

98620A/Series 300 Interfacing

The 98620A has no cabling. All Series 300 operating systems automatically select an available DMA channel for I/O (if appropriate). No software configuration or programming is required.

98620B Ordering Information

98620B	DMA card
98620-90001	Installation Note (one included w/98620)

98622A GPIO Interface Card

The 98622A General Purpose I/O interface is a flexible parallel I/O card that can send and receive up to 16 bits of data with a variety of devices. It is an HP-DIO "I/O"-style card and is user-installable.

98622A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98622A	GPIO interface card	Rev. A	Yes	Yes	4.0	5.0	3.1
Option 001	Unterminated cable	NOP	Yes	Yes	4.0	5.0	3.1
Option 002	9885M disc cable	NOP	Unsup.	Unsup.	Unsup.	No	Unsup.
Option 003	6940B multiprog. cable	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
Option 004	9866A/B printer cable	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

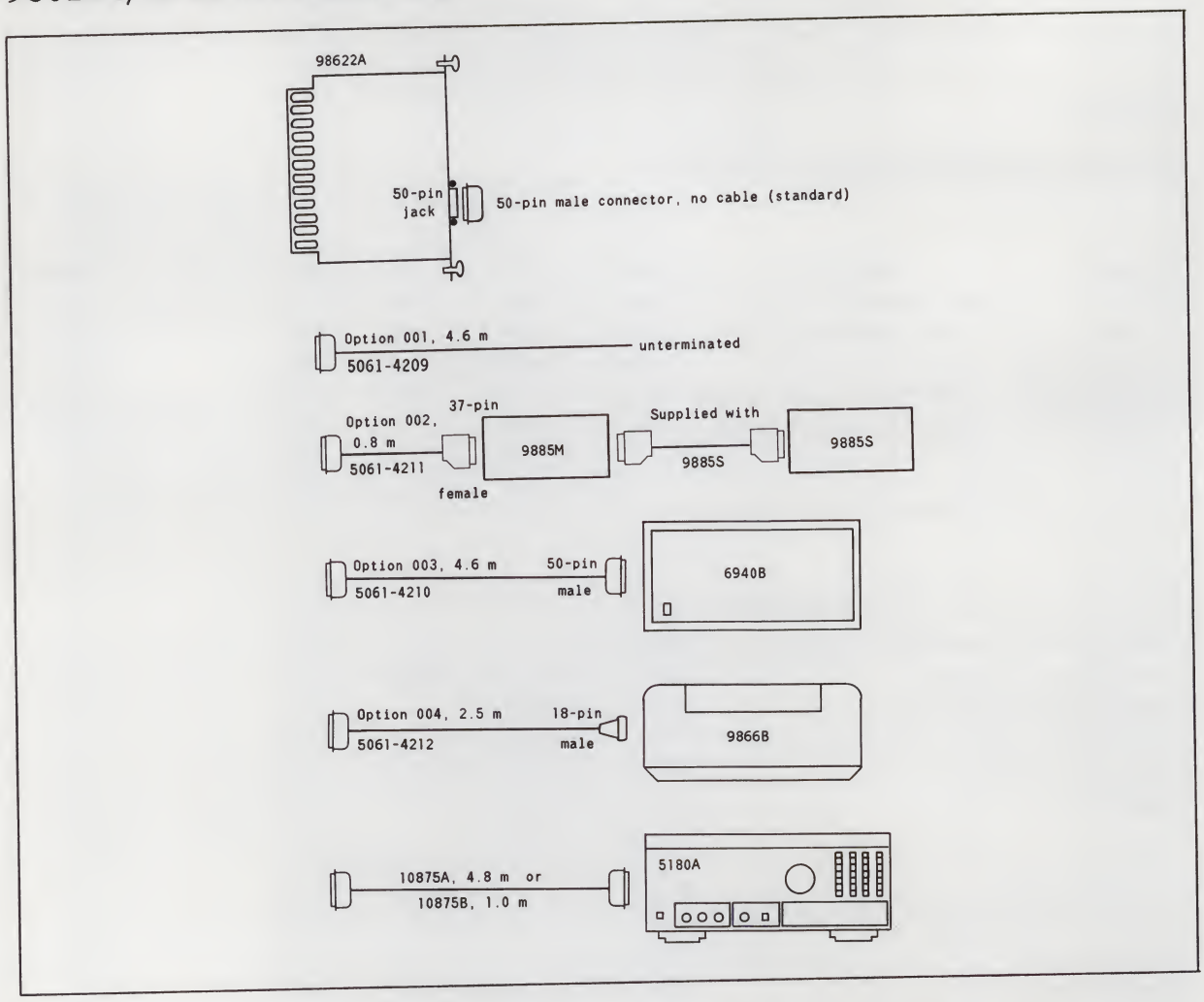
Boot ROM revision A identifies the 98622A card. The 9885M/S boot code is also present in the rev. A ROM, but has not been tested and is likely to be removed in future versions of Series 300 boot ROMs.

98622A Specification Summary

Data sheet (for complete specs.)	5954-6312
Peripheral connector	50-pin submin. "D", female
Input/output data lines	16 DOUT/16 DIN
Handshake, status and control lines	PCTL→, PFLG←
(interface driven→)	PSTS←, ST10←, ST11←
(peripheral driven←)	CTL0→, CTL1→
	PRESET→, EIR←
DIN clock source	register read, PFLG transition (2)
Interrupt levels	3...6
Driver/receiver levels	TTL
Handshake	full or pulse
DMA modes	byte, word, normal, burst
Logic invert switches for	DOUT, DIN, PSTS, PFLG, PCTL
Jumpers for	burst DMA, DOUT powerup clear
PCTL delay	250 ns, component adjustable
Typical output performance (BASIC)	670 Kbytes/sec. burst DMA
	115 Kbytes/sec. fast handshake
	75 Kbytes/sec. interrupt
Typical input performance (BASIC)	770 Kbytes/sec. burst DMA
	115 Kbytes/sec. fast handshake
	65 Kbytes/sec. interrupt

98622A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98622A	GPIO interface card	1	Yes	12: 8 to 31	Yes	Opt.



The following sample configuration is for the 9884A paper tape punch, using the 5060-1854 cable, as supported by the paper tape utility in 98305A HP EGS.

98622A Switches & Jumpers	Sample Configuration	Comments
Select code	12	Factory default
Interrupt level	3	Factory default
DIN clock source, upper	110	RD BSY READ
DIN clock source, lower	110	RD BSY READ
DOUT option select	1	
DIN option select	1	
HSHK option select	1	
PSTS option select	1	
PFLG option select	1	
PCTL option select	1	
DOUT clear jumper	In	
BURST jumper	Out	

Use with a 9885M disc also requires a 98620A/B DMA controller card.

98622A/Series 300 BASIC Interfacing

Typical device specifiers	`12` `:,12` or `:HP9885,12,0`
Binaries required	GPIO (plus HP9885 for 9885M/S)
Binaries optional	IO, MS, TRANS
Programming required	`MSI ":HP9885,12,0"`

98622A/Series 300 HP-UX Interfacing

Driver required	`gpio`
Block-mode major number	NA
Character-mode major number	22

98622A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-0
Fields	Select Code	Not Used
Values (hex)	00 to 1E	0000

Typical *mknod* for a gpio card:

```
# mknod /dev/gpio  c 22 0x0c0000
```

98622A/Series 300 Pascal Interfacing

Default volume	None
Media specifier letter	Refer to 9885 section
Modules required	GPIO or F9885
Programming required	Refer to 9885 section

98622A Ordering Information

98622A	GPIO interface card
Option 001	4.6m unterminated cable
Option 002	9885M disc cable
Option 003	6940B multiprogrammer cable
Option 004	9866A/B printer cable
10875A	4.8m 5180A cable
10875B	1.0m 5180A cable
5061-1854	____m 9884A paper tape punch cable
5061-4209	4.6m unterminated cable
5061-4210	4.6m 6940A/B multiprogrammer cable
5061-4211	0.8m 9885M disc cable
5061-4212	2.5m 9866A/B printer cable
7121-1957	Select code labels (one set included w/98622A)
98622-90000	Installation Manual (one included w/98622A)

98623A BCD Interface Card

The 98623A Binary Coded Decimal interface provides 8 data output lines and up to 43 data input lines (treated as BCD numbers or as binary data). It is an HP-DIO "I/O"-style card and is user-installable.

98623A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
98623A	BCD interface card	ID	Yes	Yes	4.0	No	No
Option 001	Unterminated cable	NOP	Yes	Yes	4.0	Unsup.	No

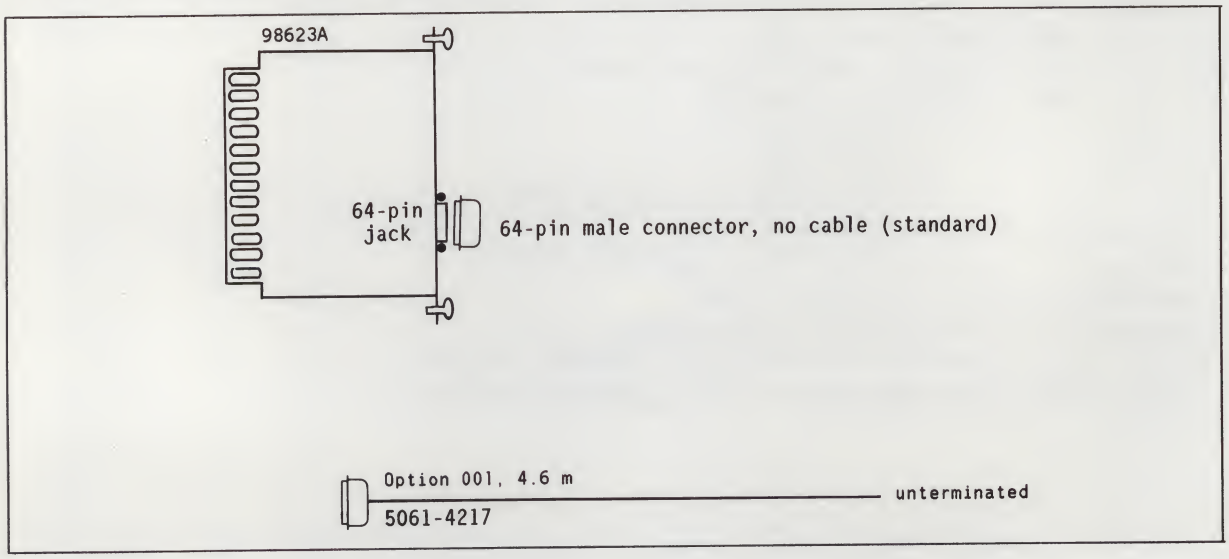
98623A Specification Summary

Data sheet (for complete specs.)	5954-6312
Peripheral connector	64-pin submin. "D", female
Input/output data lines	8 DOUT/40 DIN, SGN1, SGN2, 1 OVLD
Handshake, status and control lines	
(interface driven→)	CTLA→, CTLA-2→, PRESET→
(peripheral driven←)	DFLGA←, DFLGB←
Handshaking choices	Full/pulsed, either sense
Driver/receiver levels	TTL
Interrupt levels	3...6

98623A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98623A	BCD interface card	1	Yes	11: 8 to 31	Yes	No

98623A/Series 300 Interfacing



98623A/Series 300 BASIC Interfacing

Typical device specifier	11
Binaries required	BCD
Binaries optional	IO
Programming required	None

BASIC supports the following input data formats:

"Standard" Format						
Input line	**SGN1**	**DI1 thru DI8**	**SGN2**	**DI9**	**OVLD**	**DI10**
As ENTERed by BASIC	**Mant. Sign**	**Mantissa value**	**Exp. Sign**	**Exp. Digit**	**Over-load**	**Func-tion**
Value range	±	00000000...99999999	±	0...9	0 or 8	0...9

There is an implied "E" before the exponent digit, an implied comma after the exponent digit and an implied linefeed after the "function". The overload (OVLD) and "function" values are returned as a single decimal number in the range 0...9 (OVLD off) and 80...89 (OVLD on).

"Optional" Format						
Input line	**SGN1**	**DI4,DI2,DI6**	**SGN2**	**DI1,DI5,DI3**	**OVLD**	**DI9**
As ENTERed by BASIC	**Mant. Sign**	**Mant. Value**	**Mant. Sign**	**Mantissa Digits**	**Exp. digits Left**	**Right**
Value range	±	000...999	±	000...999	0 or 8	0 or 8

There is an implied comma after the first value, an implied "E" before the exponent digits and an implied linefeed after the exponent digits. The OVLD bit digit and the MSB of DI9 are treated as OFF=0 and ON=8, then combined into the exponent, having a range of values 0, 8, 80 or 88.

Binary Mode

In binary mode the 98623A is read as five 8-bit bytes. The first byte is DI1 and DI2; the last is DI9 and DI10. The MSB of the each returned byte is the MSB of the lower numbered BCD nibble. Binary mode does not return the sign or overload bits; these must be read from STATUS registers.

Output Data

Output data is sent in byte-serial mode. For example, you can send an arbitrary binary bit pattern by using `OUTPUT 12;CHR$(IVAL("10101101",2))`.

98623A/Series 300 HP-UX Interfacing

It may be possible to access the 98623A card in HP-UX by using the "iomap" driver (10). Registers would be accessed as offsets from the base address returned by *ioctl*. This has not been tested. Interrupts cannot be serviced and DMA cannot be used.

Driver required	`iomap`
Block-mode major number	NA
Character-mode major number	10

98623A/Series 300 HP-UX Driver Minor Number

Bits	23-08	7-0
Fields	Address/0x10000 or Select Code+0x060	64 Kbyte Regions
Values (hex)	0060 to 007F	01

Typical *mknod* for a 98623A card at select code 11:

```
# mknod /dev/6944    c 10 0x006b01
```

98623A Ordering Information

98623A Option 001	BCD interface card 4.6m unterminated cable
5061-4217	4.6m unterminated cable
7121-1957	Select code labels (one set included w/98623A)
98623-90000	Installation Manual (one included w/98623A)

98624A HP-IB Interface

The 98624A is a general-purpose Hewlett-Packard Interface Bus card and implements the IEEE 488-1978 standard. This interface is compatible with most HP-IB computer peripherals, virtually all HP-IB instruments and many GP-IB (non-HP IEEE 488) instruments. It is an HP-DIO "I/O"-style card and is user-installable.

The interface capabilities and cabling rules in this section also apply to the Series 200 and 300 built-in HP-IB interfaces. The Series 300 built-in interface also adds "interrupt on PPOLL response". All built-in HP-IB interfaces are fixed at select code 7.

98624A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98624A	HP-IB interface card	Rev. A	Yes	Yes	4.0	5.0	3.1
	as active controller	Rev. A	Yes	Yes	4.0	5.0	3.1
	as bus device	Rev. A	Yes	Yes	4.0	5.0	3.1

The interface must be configured as SYSTEM CONTROLLER for boot ROM support.

98624A Specification Summary

Data sheet (for complete specs.)	5954-6312
Peripheral connector	24-pin submin. "D", female
Input/output data lines	8 DIO in/8 DIO out
Handshake lines	DAV, NRFD, NDAC
Status and control lines	IFC, ATN, SRQ, REN, EOI
DMA modes	byte, word
Rate mode (as talker)	Normal (T_1 ≥500 ns)
PPOLL sense delay	25 μSec.
Interrupt on PPOLL response	No
Interrupt level	3...6
Typical output performance (BASIC)	270 Kbytes/sec. DMA 80 Kbytes/sec. fast handshake 55 Kbytes/sec. interrupt
Typical input performance (BASIC)	340 Kbytes/sec. DMA 110 Kbytes/sec. fast handshake 40 Kbytes/sec. interrupt

98624A HP-DIO Characteristics

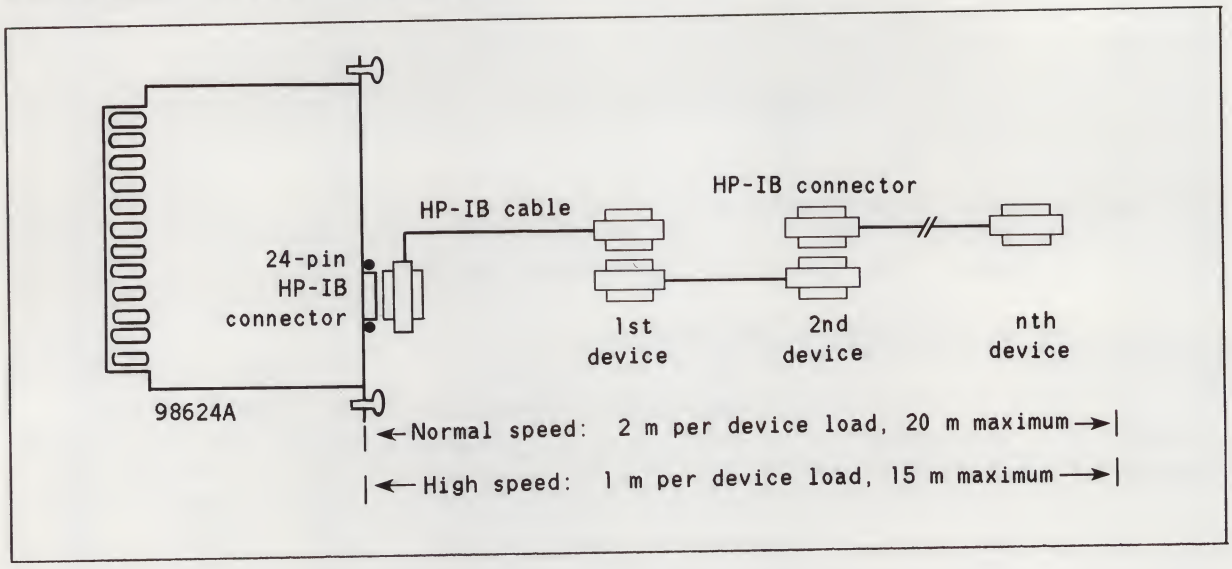
Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98624A	HP-IB interface card	1	Yes	8: 8 to 32	Yes	Opt.

98624A HP-IB Characteristics

SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C1...C5, E2

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
98624A	HP-IB interface	1	0...30	1	N or H	0.0m	None

The 98624A has a *bus* address of 21. You can change this via switches on the card. The built-in HP-IB interfaces have a fixed bus address of 21 (if system controller) and 20 (not system controller).



98624A Switches & Jumpers	Sample Configuration	Comments
Select code	8	Factory default
Interrupt level	3	Factory default
System controller	Yes	Unless computer acting as peripheral

An HP-IB interface can support devices representing a maximum of 31 device addresses (0-30) and 15 standard device loads. The interface itself represents one address and one load. Each device connected may represent one or more addresses and one or more device loads.

The maximum cable length allowed depends on several attributes of the devices connected to the interface. These attributes are listed with each supported device in this appendix.

- When only *normal* (standard) speed devices are used, the total HP-IB cabling on a single 98624A or built-in interface is limited to two metres per standard *device load* or 20 metres total, whichever is less.
- When any *high-speed* device is used, the total HP-IB cabling on a single 98624A or built-in interface is limited to one metre per standard *device load* or 15 metres total, whichever is less.
- Some devices have *internal bus cabling* which must be included in the cable length calculation.

Note that the 98624A interface does not include an HP-IB cable. The built-in HP-IB interfaces of all Series 300 mainframes do include a 1.0m cable.

Available HP-IB Cables

Product Number	Length (in meters)	Comments
10834A	0.0	Stand-off (see discussion)
92220R 10833D	0.3 0.5	Right-angle connector on one end
10833A 82977A	1.0 1.0	Also sold as: 31389A, 45529A Right-angle connector on one end
10833B 82977B	2.0 2.0	Also sold as: 31389B, 45529B Right-angle connector on one end
10833C 8120-3448 8120-3449	4.0 6.0 8.0	Also sold as: 31389C Check device loads before using Check device loads before using

The 10834A stand-off is required only for certain early HP-IB instruments (and many non-HP IEEE-488 devices). These devices have recessed HP-IB connectors that provide insufficient clearance for modern HP-IB cables.

The cables with right-angle connectors on one end are recommended for use with stacked 325mm-wide *Design-Plus* components.

To make a long cable from short cables, use a 30070-00043 joining plate. You can order cables with this plate by substituting product numbers 31389A/B/C for 10833A/B/C above. The cables supplied in both cases are identical to the 10833A/B/C cables.

Speed mode refers to the theoretical maximum transfer rate resulting from two handshake speeds allowed by the IEEE 488-1978 spec.

- **Normal speed** permits a maximum rate of approximately 500K bytes/sec. Most Hewlett-Packard HP-IB devices, particularly instruments, are compatible with normal speed. Most non-HP devices operate *only* at normal speed. Normal speed devices frequently operate at well less than the maximum transfer rate. You should use a normal speed interface if you are uncertain of the speed mode compatibility of even one device connected to the interface, and the others are standard-only or high-or-standard.
- **High speed** permits a maximum rate of approximately 1M byte/sec. Most Hewlett-Packard HP-IB computer peripherals, particularly mass storage, are compatible with high speed mode. Some require it. Others, such as CS/80 discs, can operate on either a normal or high speed bus, but with slightly impaired data rates on a normal speed bus. The 98625 provides a high speed bus.

98624A Considerations

- The 98624A is a standard or normal speed bus. This permits a maximum rate of approximately 500K bytes/sec. Most Hewlett-Packard HP-IB devices, particularly instruments, are compatible with normal speed. Most non-HP devices operate *only* at normal speed. Normal speed devices frequently operate at considerably less than the maximum transfer rate.
- All high-speed devices presently supported by the Series 200 are compatible with the 98624A interface. However, the 7908/11/12/14, 7933/35 and 7941/42/45/46 disc drives provide better performance if connected to the 98625A Disc interface.
- If you have any normal-speed-only devices, such as the 82901/02M/S or 9135A discs, they *must*

be connected to a 98624A or built-in interface, and not a 98625 interface.

- If you have a 98625A interface, you *should* connect high speed compatible disc drives to the 98625A and all other normal speed compatible devices to the 98624A or built-in. If any of the discs have dedicated or dual-controller cartridge tape drives, the cartridge tape controllers should be on a separate (normal speed) bus.
- If possible, a 9111A Graphics Tablet should be on its own 98624A bus in an HP-UX system.
- All Series 300 operating systems require that HP-IB interfaces used for discs, tapes, plotters, printers and other automatically-addressed devices be connected to HP-IB interfaces configured as "system controller". You should only use non-system-controller configurations when the interface is solely under the control of a user-supplied program which handles the requirements of acting as a device on the bus.

98624A/Series 300 BASIC Interfacing

Typical device specifiers	8 (interface card) 823 (device at bus address 23)
Binaries required	HPIB
Binaries optional	IO, TRANS and numerous others depending on connected peripherals
Programming required	None

BASIC can service interrupts generated by a wide variety of bus messages and conditions.

98624A/Series 300 HP-UX Interfacing

This section describes only the use of the 98624A (or built-in) interface as a generic HP-IB interface (e.g. for instrument control). For use of this card with supported computer peripherals, refer to the peripheral in this appendix.

Driver required	`hpib`
Drivers optional	Numerous, depending on connected devices
Block-mode major number	Refer to connected devices
Character-mode major number	21

98624A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	Bus Address	Not Used
Values (hex)	00 to 1E 1F = "as configured"	00 to 1E	00

Typical *mknod* for an HP-IB card at select code 8 and an HP 3497A scanner at bus address 7.

```
# mknod /dev/hpib     c 21 0x080000
# mknod /dev/hp3497   c 21 0x080700
```

98624A/Series 300 HP-UX Considerations:

- The special "1F" (hex) bus address implies "do not attempt to reconfigure the bus before reading or writing data". This is the device file that is used when the 98624A is being used as a device (rather than as system/active controller).

98624A/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB
Modules optional	numerous - refer to connected devices
Programming required	I/O library calls for generic HP-IB I/O, otherwise refer to supported peripherals

98624A Ordering Information

98624A	HP-IB interface card
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
30070-00043	HP-IB cable joining plate
7121-1957	Select code labels (one set included w/98624A)
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable
98624-90000	Installation Manual (one included w/98624A)

98625A High-Speed HP-IB Interface

The 98625 is a special-purpose Hewlett-Packard Interface Bus (HP-IB) card. It implements the "high speed" mode of the IEEE 488-1978 specification and is designed primarily for use with discs, tapes and high-speed line printers. It does not have the full functionality required for use with instruments. The 98625 is an HP-DIO "I/O"-style card and is user-installable.

98625/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support 310	Hardware Support 320	Earliest Operating System Version BASIC	Earliest Operating System Version HP-UX	Earliest Operating System Version Pascal
98625A	High-speed HP-IB i/f						
	with AMIGO* discs	Rev. A	Yes	Yes	4.0	5.0	3.1
	with AMIGO printers	NOP	Yes	Yes	No	5.0	No
	with CIPER printers	NOP	Yes	Yes	No	5.0	No
	with CS/80 discs	Rev. A	Yes	Yes	4.0	5.0	3.1
	with CS/80 tapes	Rev. A	Yes	Yes	4.0	5.0	3.1
	with SS/80 discs	Rev. A	Yes	Yes	4.0	5.0	3.1
	with 797x tapes	NOP	Yes	Yes	No	5.0	No
	with other devices	NOP	Yes	Yes	No	No	No

98625 Specification Summary

Data sheet (for complete specs.)	5954-6312
Peripheral connector	24-pin submin. "D", female
Input/output data lines	8 DIO in/8 DIO out
Handshake lines	DAV, NRFD, NDAC
Status and control lines	IFC, ATN, SRQ, REN, EOI
DMA modes	byte
Rate mode (as talker)	High-speed (T_1 ≥350 ns)
PPOLL sense delay	25 μSec.
Interrupt on PPOLL response	Yes
Interrupt level	3...6
Typical output performance (BASIC)	770 Kbytes/sec.
Typical input performance (BASIC)	425 Kbytes/sec.

98625 HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98625A	Disc interface card	1	Yes	14: 8 to 32	No	Req.

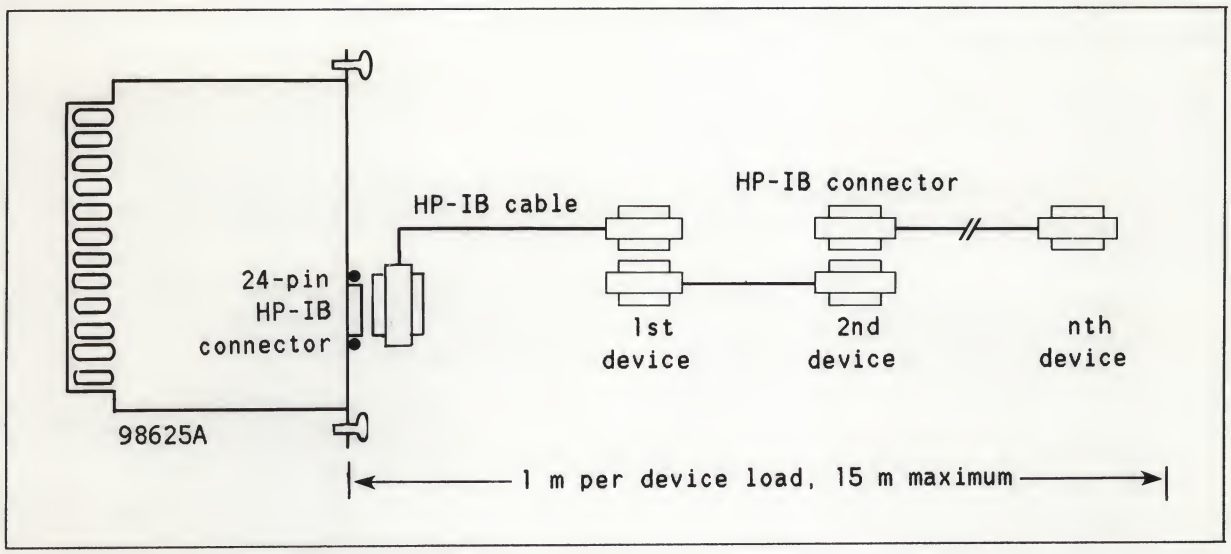
98625A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
98625A	Disc interface	1	30	7	H or N	0.0m	None

The 98625 is always system and active controller. The fixed bus address of 30 is generally not a concern because all peripherals recommended for use with this interface have an address range of 0...7, and the 98625 is not supported for computer-to-computer connections.

---

* Some AMIGO discs (e.g. 82901/01M, 9135A) are not compatible with high-speed interfaces.



98625 Switches & Jumpers	Sample Configuration	Comments
Select code	14	Factory default
Interrupt level	4	HP-UX requires

Refer to the 98624A section for a discussion of high-speed vs normal-speed mode. Due to the way in which high-speed devices are accessed, this interface is limited to support of devices representing a maximum of eight device addresses (0-7). The interface itself represents one (address 30).

Although it does support 15 standard device loads, the interface itself represents seven loads. This plus the addressing restriction typically limits the number of connected devices to seven or less. Each device connected may represent one or more addresses and one or more device loads.

Unlike a normal-speed bus, the total HP-IB cabling is limited to one metre per standard device load or 15 metres total, whichever is less. Some devices have internal bus cabling which must be included in the cable length calculation. The internal cabling is listed with each device in this appendix.

Available HP-IB Cables

Product Number	Length (in meters)	Comments
92220R	0.3	Right-angle connector on one end
10833D	0.5	
10833A	1.0	Also sold as: 31389A, 45529A
82977A	1.0	Right-angle connector on one end
10833B	2.0	Also sold as: 31389B, 45529B
82977B	2.0	Right-angle connector on one end
10833C	4.0	Also sold as: 31389C
8120-3448	6.0	Check device loads before using
8120-3449	8.0	Check device loads before using

The cables with right-angle connectors on one end are recommended for use with stacked 325mm-wide *Design-Plus* components.

To make a long cable from short cables, use a 30070-00043 joining plate. You can order cables with this plate by substituting product numbers 31389A/B/C for 10833A/B/C above. The cables supplied in both cases are identical to the 10833A/B/C cables.

98625 Considerations

- HP-UX supports one and only one 98625A interface card.
- The performance advantage that this interface offers over the 98624A or built-in HP-IB interface will not be realized unless the computer also has a 98620A/B DMA card (98620B is required for HP-UX).
- This is not a general-purpose IEEE 488-1978 interface. Only the specified mass-storage and selected other high-speed devices should be connected to this bus. User register-level read/write and interrupt servicing are not available in any operating system.
- Most Hewlett-Packard HP-IB computer peripherals, particularly mass-storage, are also compatible with high-speed mode. Some require it. Others, such as CS/80 discs, can operate on either a normal or high-speed bus, but with impaired data rates on the normal speed bus.
- If you have any normal-speed-only devices (such as the 82901M/S or 9135A), they must be connected to a 98624A or built-in interface, and not the 98625 interface.
- If you have both a 98625 and 98624A (or built-in) interface, you *should* connect high-speed compatible disc drives to the 98625 and all other normal speed compatible devices to the 98624A/built-in. If any of the discs have dedicated or dual-controller cartridge tape drives, the cartridge tape controllers should be on a separate normal-speed bus in HP-UX.
- The 98625A may not be installed in a 9888A bus expander. It is compatible with the 98568A bus expander.

98625/Series 300 BASIC Interfacing

Typical device specifier	1400 (device at bus address 0)
Binaries required	FHPIB plus CS80 or DISC
Binaries optional	MS, TRANS
Programming required	None

98625/Series 300 HP-UX Interfacing

The 98625 is not recommended for use as a Device I/O Library (DIL) HP-IB interface. For peripheral configuration information on the 98625, refer to the peripheral. The drivers and *mknod*s are identical to the 98624A.

During large disc transfers, the 98625A can hold off interrupts from other interface cards. At baud rates above 1200 bps, the following single-byte buffered RS-232C interfaces can experience overruns (loss) on burst data input: 98626A, 98644A and Series 300 built-in. This does not normally affect typed input at any data rate. For *uucp* connections, graphics terminal support and applications requiring multiple-character softkeys or terminal readback, the bufferred 98642A and 98628A interfaces are recommended.

98625/Series 300 Pascal Interfacing

Default volume	Refer to peripheral
Modules required	DISC_HPIB, DMA plus CS80 or AMIGO
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
Programming required	Refer to peripheral

98625 Ordering Information

98625A	HP-IB interface card
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
30070-00043	HP-IB cable joining plate
7121-1957	Select code labels (one set included w/98625)
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable
98625-90000	Installation Manual (one included w/98625A)

98626A RS-232C Serial Interface

The 98626A is an EIA RS-232C (CCITT V.28/V.24) interface for the Series 200/300 computers. It is user-installable. In general the 98644A interface is more economical unless the following features (of the 98626A) are required:

- Switch selected baud rate, character length, stop bits and parity - Although these features are programmable on all Series 200/300 RS-232C interfaces, some BASIC/Pascal application software may not perform this function. Even if you have access to the source code, you may not wish to modify it.
- Individual switches for the DSR, CD, CTS and RI (OCR1) modem handshake lines - The 98644A has a single switch for all four lines.
- "Handshake type" switches - these switches are defined by some boot ROMs and by the Pascal system to select none, Enq/Ack or Xon/Xoff host (output) software handshaking.
- 50-pin connector providing host power - The 13265A, 13266A and 27201A accessories are normally supplied with a matching 50-pin connector and are powered by their host.
- Optional drivers and receivers: OCD3, OCD4, OCR2, OCR3

The 98626A, 98644A and Series 200/300 built-in RS-232C interfaces have a one-byte buffer. They also do not provide an on-board software or hardware handshake for inbound data. Data loss can occur on input in a busy system if the aggregate baud rate for all single-byte-buffered interfaces is above 2400 bps and the character rate is above 240 cps (e.g. above human typing speed). If your application requires bursts of input data at high speeds, consider the buffered 98628A or 98642A interfaces.

On the other hand, the lack of a multi-character buffer makes the 98626A, 98644A and built-in interfaces better suited to applications where timed waits (in your program) must occur between output characters; for example, allowing carriage return time on older teleprinters.

98626A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98626A	RS-232C interface	Rev. A	Yes	Yes	4.0	5.0	3.1

The revision A boot ROM supports the 98626A as an alpha device (console display and keyboard) if the REMOTE switch is set. The boot ROM honors all card switch settings.

98626A Specification Summary

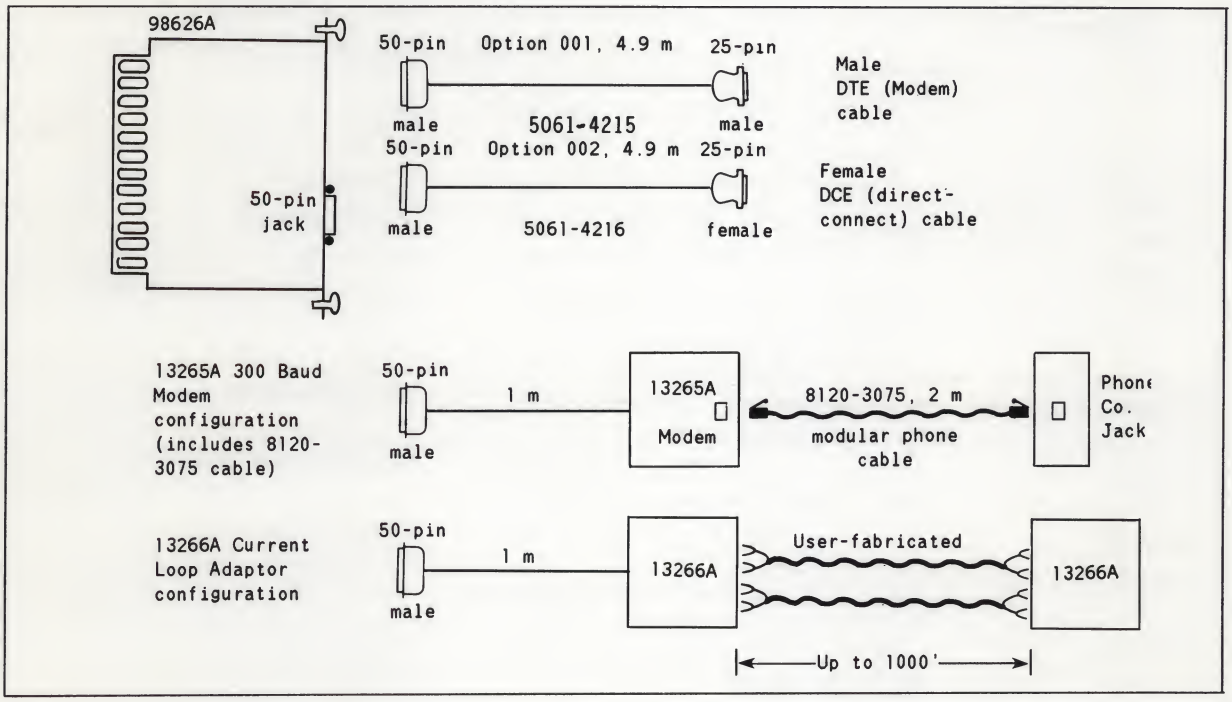
Data sheet (for complete specs.)	5954-6312
Electrical interface	EIA RS-232C, CCITT V.24/V.28
Data rates (bps)	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 19200
Input/output buffer size	1/1 byte
Character size	5 to 8 bits
Parity	Odd, Even, None, Zeroes, Ones
Stop bits	1, 1.5 (5 bits/char) or 2 (6...8 bits/char)
Hardware handshake	DSR, CD, CTS, RI
Software handshake	None
Interrupt level	3...6 (default 3)

98626A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98626A	RS-232C interface	1	Yes	9: 8 to 31	Yes	No

98626A/Series 300 Interfacing

The standard (no option) 98626A product is supplied without a cable.



98626A Switches	Sample Configuration	Comments
Select code	11	Built-in RS-232C is at 9
Interrupt level	5	Suggested for HP-UX
Remote jumper	Present	If ITE present and is console
	Removed	If terminal on this interface is console
Baud rate	9600	
Modem status lines	Disconnect	Terminal, bar code reader
	Connect	Modem, printer, *uucp*
Character length (bits)	Eight	Suggested for HP terminals
Stop bits	One	Switch position 0
Parity	None	
Handshake type	10	HP-UX and Pascal only 00 = Host Enq/Ack (ignored by HP-UX) 01 = No handshake 10 = Host Xon/Xoff 11 = No handshake

All of the above may be overridden by software except select code, interrupt level, modem line connect/disconnect and the remote/local jumper.

98626A Host Connections Provided

Interface Cable	Con-nector	Con-nector	Cable/Device(s)	Con-nector	Provides Host Connection Type
Option 001	25M				DTE(M)
Option 002	25F				DCE(F)
Option 001	25M	25F	13232U	25F	DCE(F)
Option 001	25M	25F	Modem~Modem	25F	DCE(F)
Option 002	25F	25M	13242G (5m) or 92219R (15m)	25M	DIR25(M)

98626A Peripheral Connections Available

Host Type Required	Con.	Peripheral Cable	Con.	Con.	Peripheral
DCE(F)	25M	40242M(5m)	25M	25F	2392A terminal
DIR25(M)	-	-	-	25F	2601A daisywheel printer
DCE(F)	25M	Included (5m) or 92218A (15m) or 92222M (0.2m)	25M	25F	2601A daisywheel printer
DCE(F)	25M	13222N (5m) or 92217A (15m)	50M	50F	2622A terminal
DCE(F)	25M	13222N (5m) or 92217A (15m)	50M	50F	2624B terminal (port 1)
DIR25(M)	-	-	-	25F	2624B terminal (port 2)
DCE(F)	25M	13242N (5m) or 92218A (15m) or	25M	25F	2624B terminal (port 2)
DTE(M)	25F	17255D (5m)	25M	25F	2686A *LaserJet* printer
DCE(F)	25M	13242N (5m) or 92218A (15m)	25M	25F	2686A *LaserJet* printer (HP-UX only)
DTE(M)		<none required>		25F	37212A Modem
DCE(F)	25M	8120-3258	25M	25F	39800/01A Bar Code Reader
DCE(F)	25M	92221M (1.5m)	9M	9F	45710A, 45711A *Portable* PCs
DTE(M)		<none required>		25F	92205A/B/C Modems
DCE(F)	25M	82974A (1.5m)	25F	25M	82819A in 9807A *Integral* PC
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	9816A/S built-in RS-232C
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	9817A/H/L* built-in RS-232C
DCE(F)	25M	92221M (1.5m)	9M	9F	98561-66530* Model 320
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	98626A* or 98628A* interfaces
DIR25(M)	-	-	-	25F	98642A* Port 0
DCE(F)	25M	92219S (5m)	25M	25F	98642A* Port 0
DCE(F)	25M	92219T (15m) +92219U	RJ11(M)	RJ11(M)	98642A* Port 1, 2 or 3
DCE(F)	25M	13242N (5m) or 92218A (15m) 92222M (0.2m)	25M	25F	98644A* RS-232C interface, 98561-66511/12/13* Model 310 built-in

* This cabling is suitable for use of the remote computer as a terminal only. For use in *uucp* communications (or both), see the *uucp* discussion under 98642A.

98626A/Series 300 BASIC Interfacing

Typical device specifier	11
Binaries required	SERIAL
Binaries optional	IO
Programming required	Refer to peripheral

98626A/Series 300 BASIC Considerations:

- BASIC does not support the "handshake type" switches on the 98626A. Non-trivial user programming is required to implement a software handshake.
- The TRANSFER statement does not honor the hardware handshake switches. If you must use TRANSFER, you will need to prevent data overruns on output to slow peripherals by either reducing the baud rate or by inserting device-dependent null characters in the data.

98626A/Series 300 HP-UX Interfacing

Drivers required	tty
Block-mode major number	NA
Character-mode major number	1

98626A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-4	3	2	1	0
	Select	Not	Access Type			
Fields	Code	Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	000	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod* for 2392A at select code 11

```
# mknod /dev/tty02  c 1 0x0b0004
```

98626A/Series 300 HP-UX Considerations:

- In a system with a 98625A disc interface, loss of input data on unbuffered RS-232C is possible at baud rates above 300 bps and character rates above 30 cps.
- The 98626A, 98644A and built-in RS-232C interfaces are not recommended for use with graphics terminals under DGL or *Starbase* graphics at data rates above 300 baud. These libraries read bursts of information from the terminal during graphics input operations and prior to starting output operations. The pre-output readback may be inhibited by selecting "output spooling" in your graphics program.

98626A/Series 300 Pascal Interfacing

Default volume	None
Modules required	RS232
Modules optional	PRINTER
Programming required	Refer to connected peripheral

98626A Ordering Information

98626A	RS-232C asynchronous serial interface
Option 001	Adds 5061-4215 4.6m DTE (male) cable
Option 002	Adds 5061-4216 4.6m DCE (female) cable
13265A	50-pin to Bell 103 modem
13266A	50-pin to current-loop adaptor
5061-4215	4.6m male DTE cable
5061-4216	4.6m female DCE cable
5957-9918	Terminal cabling manual
7121-1957	Select code labels (one set included w/98626A)
92178A	Male 25-pin RS-232C connector kit (2 connectors)
92178B	Female 25-pin RS-232C connector kit (2 connectors)
92178C	Male & Female 25-pin RS-232C connector kit (one each)
92234X	*The RS-232 Solution* - Campbell
98626-90000	Installation manual (one included w/98626A)

98627A Color Graphics Interface

The 98627A is a medium resolution color video I/O card for the Series 200/300 computers. Series 200 and 300 operating systems support the 98627A only as a graphics device.

The 98627A is compatible with the 13279B 19-in. monitor. 13279B Option 035 (short persistence phosphor) is recommended unless otherwise advised. The 98627A is user-installable.

98627A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98627A	Color graphics interface	Rev. A	Yes	Yes	4.0	5.0	3.1

The revision A boot ROM supports the 98627A as an alpha device (console display) if it is the only video interface in the computer. Substantial user programming is necessary to use the 98627A as an alpha display after system boot.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98627A	Color graphics interface	4.0	5.0	No	3.1

98627A Specification Summary

Refresh rate	Depends on resolution
Standard resolution	512 × 390 × 3, 50/60 Hz
Medium resolution	512 × 512 × 3, 46.5 Hz
TV resolution	512 × 474 × 3, 30 Hz
	512 × 512 × 3, 25 Hz
Colors available	8 (white, red, yellow, green, cyan, blue, magenta, black)
Default alpha resolution	NA
Video output (nominal)	1.6 V pk-pk into 75 ohms, w/sync
	1.0 V pk-pk without sync
Sync/green composite output	40%/60% mixture
Output connectors	Four 50 ohm BNC, three if sync combined with green output
Cable recommended	75 ohm RG-69/U
Monitor bandwidth	20 MHz (24.8 kHz scan)
Temperature tolerance	0 to 45°C operating
Relative humidity	0 to 80% non-condensing
Supported monitor	HP 13279B (19-in.)

98627A Specifications Summary, continued...

Tested monitors	Aydin 8810 (13-in.) Aydin 8830 (19-in.) Barco CDCT 3351 (19-in.) Barco CDCT 3/51 (20-in.) Barco CDCT 3366 (26-in.) Conrac 7211 C13 (13-in.) Conrac 7211 C19 (19-in.) DeAnza CM13 LC (13-in.) DeAnza CM19 LC (19-in.) Genisco GCT 3088-2 (13-in.) Genisco GCT 3089-2 (19-in.) Mitsubishi C34-19N (13-in.) Mitsubishi C39-10 (19-in.) Mitsubishi C39-19N (19-in.)

Timing digrams are provided in the 98627A Installation manual for use with other monitors.

98627A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98627A	Color graphics i/f	1	Yes	28&29: 10&11 to 30&31	Yes	No

The 98627A card uses a *pair* of select codes. *Note* - The default second select code (29) conflicts with the default select code of the 98633A Multiprogrammer interface card.

98627A/Series 300 Interfacing

The video output is four female BNC connectors (RGB and sync). A switch on the 98627A optionally combines sync with the green output. The supported HP 13279B monitor can connect with either three or four cables.

98627A Switches	Sample Configuration
Sync	Combined with green
Scan	24.8 KHz

A monitor frequently requires internal adjustment when first connected to a 98627A card. The 13279B monitor included installation and adjustment by an HP Customer Engineer.

The 98627A card and 13279B monitor have not been tested with the 15/30m coax cables of the 46082A/B HP-HIL/RGB extensions. The 98627A card is not compatible with connection through a 98546A compatibility video interface.

98627A/Series 300 BASIC Interfacing

Typical device specifier	28
Binaries required	GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 28,"98627A"`

98627A/Series 300 HP-UX Interfacing

Drivers required	`graphics`
Block-mode major number	NA
Character-mode major number	12
DGL handler	D0042
Starbase handler	None
Windows/9000 support	None

98627A/Series 300 HP-UX Driver Minor Number ('graphics' driver only)

Bits	**23-16**	**15-12**	**11-8**	**7-0**
Fields	Select Code	Not Used	Position	Not Used
Values (hex)	0C to 1E	0	2	00

Typical *mknod* for 98267A.

```
# mknod /dev/graphics  c 12 0x1c0200
```

98627A/Series 300 Pascal Interfacing

Default volume	None
Modules required	GRAPHICS (any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

98627A Ordering Information

98627A	Color graphics video interface
7121-1957	Select code labels (one set included w/98627A)
8120-3616	2.4m BNC-to-BNC video cables (4 included w/98627A)
98627-90000	Installation manual (one included w/98627A)

98628A RS-232C Datacomm Interface

The 98628A is a buffered EIA RS-232C (CCITT V.28), RS-422, RS-423 and RS-449 interface for the Series 200/300 computers. It supports asynchronous serial and HP asynchronous multipoint (MTS or DSN/DL, slave) protocol. The 98628A is a microprocessor-based (Z80) interface. A similar, user-microprogrammable, interface is also available. Refer to 98691A. The 98628A is user-installable.

For BASIC and Pascal use, the 98644A, 98626A or built-in RS-232C interfaces are more economical unless the following features of the 98628A are required:

- Buffering to prevent data overruns on input.
- Connection to an HP MTS or DSN/DL network.
- Host or device Xon/Xoff or Enq/Ack handshaking in BASIC.
- Support for the TRANSFER statement (with handshake) in BASIC.

For HP-UX use, the 98642A MUX interface is more economical when two or more ports are used). The 98642A is also supported by the Series 300 Rev. A boot ROM. The 98628A is suitable for use with graphics terminals in HP-UX.

The DSN/DL capability of the 98628A is standard. At one time it was Option 100, and older cards are so marked on their cover plates.

98628A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98628A	Datacomm interface						
	Async serial RS-232C	ID	Yes	Yes	4.0	5.0	3.1
	Async RS-422/423/449	ID	Yes	Yes	Unsup.	Unsup.	Unsup.
	MTS-DSN/DL configuration	ID	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

The revision A boot ROM identifies the 98628A but does not support it as a system console (no message output or keyboard input).

No supported peripherals have been tested using the RS-422/423/499 cabling. The MTS-DSN/DL capabilities of the 98628A have not been tested in any Series 300 computer, nor in BASIC 4.0 or Pascal 3.1 on any HP 9000 computer. This capability has never been tested under HP-UX.

98628A Specification Summary

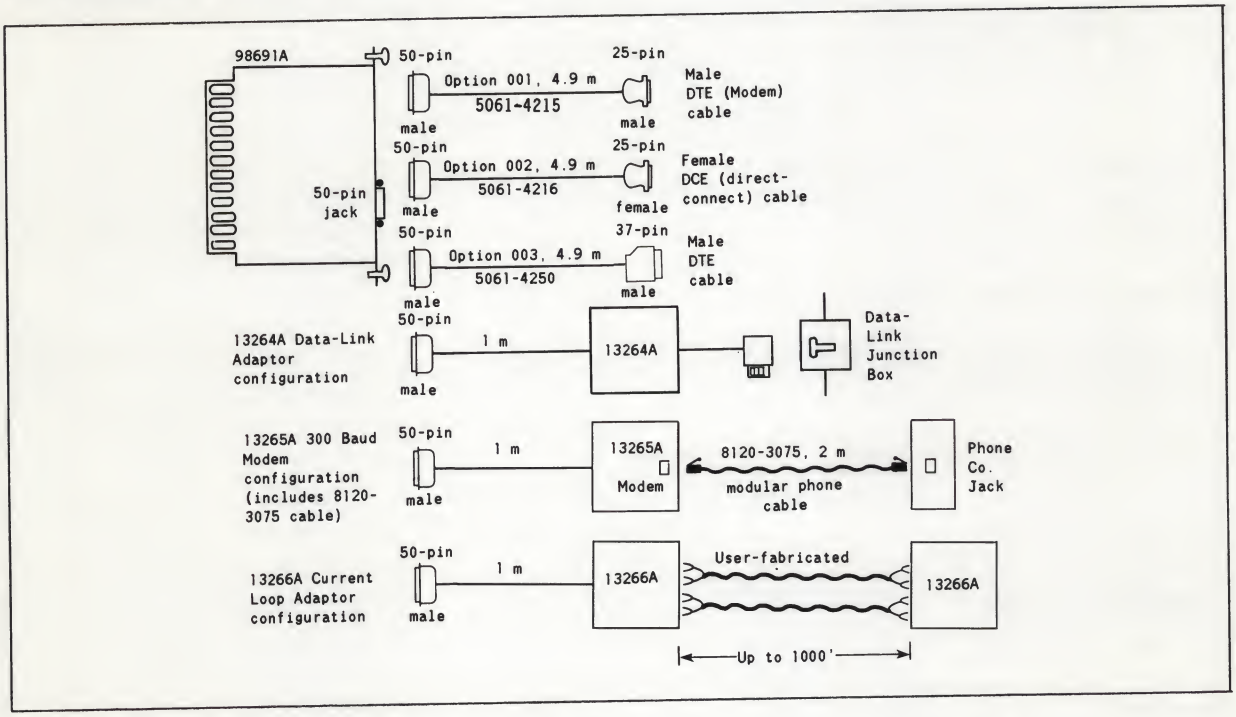
Data sheet (for complete specs.)	5954-6312
Electrical interface	EIA RS-232C, CCITT V.24/V.28 EIA RS-422, RS-423, RS-449 HP DSN/DL (Asynchronous multipoint)
Data rates (bps)	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 19200
Input/output buffer size	256/256 bytes (RS-232C)
Character size	5 to 8 bits
Parity	Odd, Even, None
Stop bits	1 or 2
Hardware handshake	DSR, CD, CTS, RI, non-modem Full or half-duplex modem
Software handshake	Xon/Xoff, Enq/Ack - host or device
Interrupt level	3...6 (default 3)

98628A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98628A	RS-232C interface	1	Yes	20: 8 to 31	Yes	No

98628A/Series 300 Interfacing

The standard (no option) 98628A product is supplied without a cable.



98628A Switches	Sample Configuration	Comments
Select code	20	
Interrupt level	3	
Protocol	Async	
Baud rate	9600	
Handshake type	Off, non-modem FDX modem On, non-modem	Terminal, bar code reader modem, 2334A, *uucp* printer
Character length and parity	Eight, none	Suggested for HP terminals
Data link switches	defaults	not used

All of the above may be overridden by software except select code and interrupt level.

98628A Host Async RS-232C Connections Provided

Interface Cable	Con-nector	Con-nector	Cable/Device(s)	Con-nector	Provides Host Connection Type
Option 001	25M				DTE(M)
Option 002	25F				DCE(F)
Option 001	25M	25F	13232U	25F	DCE(F)
Option 001	25M	25F	Modem~Modem	25F	DCE(F)
Option 002	25F	25M	13242G (5m) or 92219R (15m)	25M	DIR25(M)

98628A Peripheral Connections Available

Host Type Required	Con.	Peripheral Cable	Con.	Con.	Peripheral
DIR25(M)	-	-	-	25F	HP 150(all), 2625A, 2628A, 2624B port 2 terminal
DCE(F)	25M	13242N (5m) or	25M	25F	HP 150(all), 2625A, 2628A, 2624B port 2 terminal
DCE(F)	25M	40242M(5m)	25M	25F	2392A, 2393A, 2397A terminal
DIR25(M)	-	-	-	25F	2601A daisywheel printer
DCE(F)	25M	Included (5m) or 92218A (15m) or 92222M (0.2m)	25M	25F	2601A daisywheel printer
DCE(F)	25M	13222N (5m) or 92217A (15m)	50M	50F	2622A, 2623A, 2627A, 2624B port 1 terminal
DTE(M)	25F	17255D (5m)	25M	25F	2686A *LaserJet* printer
DCE(F)	25M	13242N (5m) or 92218A (15m)	25M	25F	2686A *LaserJet* printer (HP-UX only)
DTE(M)		<none required>		25F	37212A Modem
DCE(F)	25M	8120-3258	25M	25F	39800/01A Bar Code Reader
DCE(F)	25M	92221M (1.5m)	9M	9F	45710A, 45711A *Portable* PCs
DTE(M)		<none required>		25F	92205A/B/C Modems
DCE(F)	25M	82974A (1.5m)	25F	25M	82819A in 9807A *Integral* PC
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	9816A/S built-in RS-232C
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	9817A/H/L* built-in RS-232C
DCE(F)	25M	92221M (1.5m)	9M	9F	98561-66530* Model 320
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	98626A* or 98628A* interfaces
DIR25(M)	-	-	-	25F	98642A* Port 0
DCE(F)	25M	92219S (5m)	25M	25F	98642A* Port 0
DCE(F)	25M	92219T (15m) +92219U	RJ11(M)	RJ11(M)	98642A* Port 1, 2 or 3
DCE(F)	25M	13242N (5m) or 92218A (15m) 92222M (0.2m)	25M	25F	98644A* RS-232C interface, 98561-66511/12/13* Model 310 built-in

* This cabling is suitable for use of the remote computer as a terminal only. For use in *uucp* communications (or both), see the *uucp* discussion under 98642A.

98628A/Series 300 BASIC Interfacing

Typical device specifier	20
Binaries required	DCOMM
Binaries optional	IO, TRANS
Programming required	Refer to peripheral

98628A/Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1

98628A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-4	3	2	1	0
	Select	Not	Access Type			
Fields	Code	Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	000	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod* for 2393A at select code 20

```
# mknod /dev/tty02  c 1 0x140004
```

98628A/Series 300 Pascal Interfacing

Default volume	None
Modules required	DATA_COMM
Modules optional	PRINTER
Programming required	Refer to connected peripheral

98628A Ordering Information

98628A	RS-232C asynchronous serial interface
Option 001	Adds 5061-4215 4.6m RS-232C DTE (male) cable
Option 002	Adds 5061-4216 4.6m RS-232C DCE (female) cable
Option 003	Adds 5061-4250 4.6m RS-423/449 DTE (male) cable
13264A	50-pin to 3-wire Data Link adaptor
13265A	50-pin to Bell 103 modem
13266A	50-pin to current-loop adaptor
3074A	25-pin(F) to 3-wire Data Link adaptor
5061-4215	4.6m male RS-232C DTE cable
5061-4216	4.6m female RS-232C DCE cable
5061-4250	4.6m RS-423/449 DTE (male) cable
5957-9918	Terminal cabling manual
7121-1957	Select code labels (one set included w/98628A)
92178A	Male 25-pin RS-232C connector kit (2 connectors)
92178B	Female 25-pin RS-232C connector kit (2 connectors)
92178C	Male & Female 25-pin RS-232C connector kit (one each)
92234X	*The RS-232 Solution* - Campbell
98628-90001	Installation manual (one included w/98628A)

98629A SRM/MUX Interface

The 98629A interface is used by the Series 200/300 BASIC, Pascal and 98693A Series 200 HP-UX SRM software to access shared files and peripherals on a 50960A/S, 9920A Option 500 or 9826A Option 500 Shared Resource Management server/controller. The 98629A is user-installable.

For new Series 200/300 and 500 SRM workstations, the 50961A SRM/Coax interface provides more flexibility at a lower price. Software configuration and programming information for the 98629A is given in the 50961A section. There is also an upgrade kit (50961U Option 200) to convert a 98629A to a 50961A.

This section documents the use of the 98629A SRM interface with the 98028A SRM Multiplexer and 97061-series cables. This configuration is recommended only where an existing 98028A must be used.

This section does not document the configuration of this interface in the SRM server/controller. For that data, refer to the 5953-9550 **Shared Resource Management System Planning Guide** and 09800-90020 **HP 9000 Series 200 Configuration Information and Order Guide**

98629A/Series 300 Support Summary

The Series 300 Rev. A boot ROM can load any SYSTEM ("SYS...") file from SRM. The HP-UX system cannot execute from an SRM disc.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98629A	SRM/MUX interface	Rev. A	Yes	Yes	4.0	5.0*	3.1

98629A Specification Summary

Data sheet (for complete specifications)	5953-9535
Cable type	97061A/B/C/D plus 98028A Mux
Maximum cable length	60m (interface to mux)
SRM interfaces per computer	select-code limited
98629A cards per mux	5 (including server)
Interrupt levels	3...6
Basic link rate	750K bps

98629A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98629A	HP SRM/Mux interface	1	Yes	21: 8 to 31	Yes	No

The factory default select code of 21 is the same as the 98643A LAN/300 interface card. If both types of card are present (HP-UX only), change the select code of the 98643A card.

* Requires 98693A SRM Access software.

98629A/Series 300 Interfacing

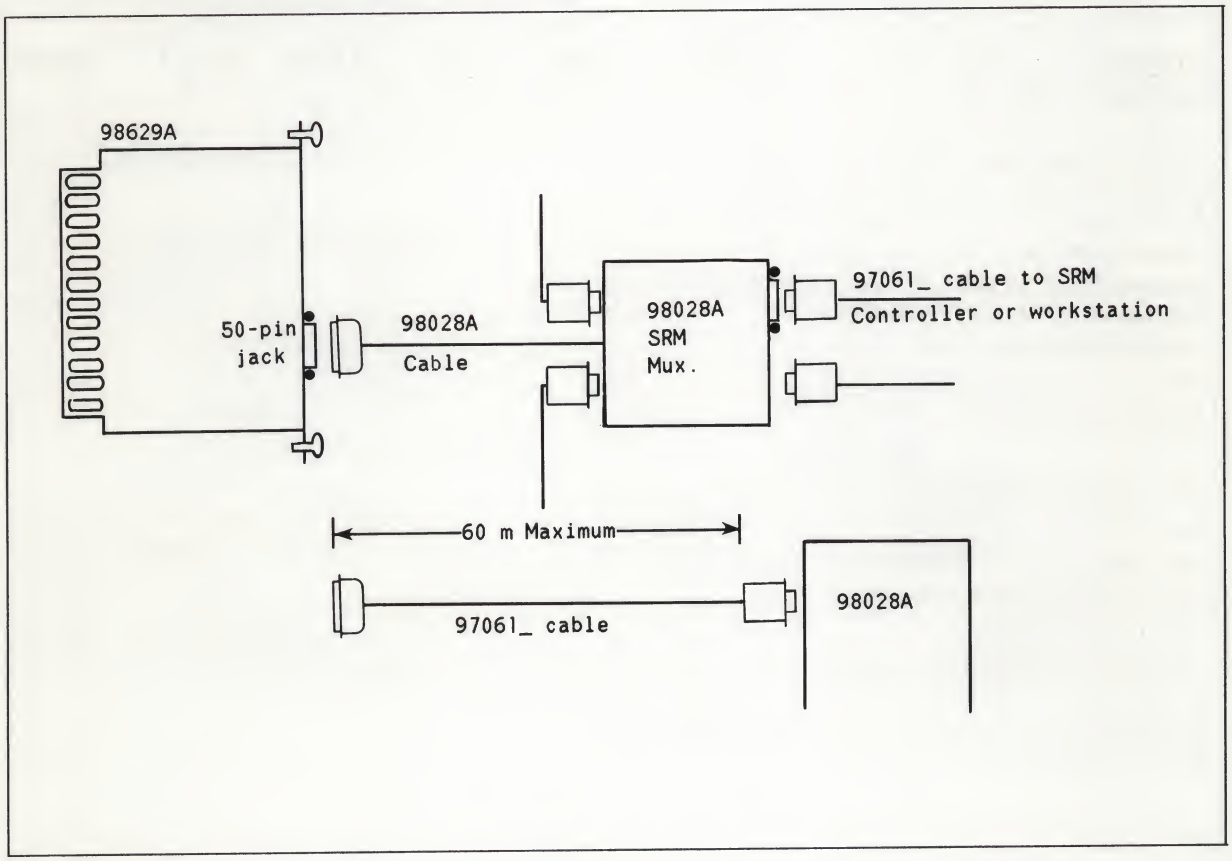
98629A Switches	Sample Configuration	Comments
Select Code	21	Factory default (caution if 98643A present)
Node	10	10...63 for workstations (each must be unique) 00...09 for servers/controllers (each must be unique)
Interrupt level	4	Required

The 98629A interface is used both by the SRM controller and SRM workstations. It includes no cables. The computers which may connect to an SRM controller are:

- Any Series 200 or 300 computer with a 98629A interface. Only a 50960A/S Server, Model 220 or Model 226 may act as SRM controller.
- A Series 500 computer with a 27123A interface.
- An HP9835 or 9845 computer with a 98029A interface and SRM ROM; however, the 98029A cannot supply power to the 98028A MUX.

The 98629A interface connects to the MUX in one of two ways:

- directly to the 50-pin connector of the 1.0m data/power cable of the 98028A SRM MUX.
- via a 97061-series SRM cable to one of the 15-pin data-only ports of the MUX.



The 97061-series cables are available in the following lengths:

Product	Length
97061A	10m
97061B	25m
97061C	60m
97061D	60m (not terminated, includes connector kits)

The 98028A SRM Multiplexer supports one to four workstations. It has four 15-pin connectors and a cable terminated in a 50-pin connector. The 50-pin cable (1m) supplies power to the Multiplexer and must be connected to a 98629A or 27123A interface. The 15-pin connectors are used for the 97061-series cables to any supported SRM workstation, or to the controller if the 50-pin connector is connected to a workstation or a different controller.

If less than the five connections are used, one of the ports used must be via the 50-pin cable. The computer powering the 98028A need not be the SRM controller.

98629A Considerations

- You should consult the **Shared Resource Management System Planning Guide** (*HP Part No. 5953-9550*) before ordering an SRM system.
- There is a significant difference in the power required by the 98629A interface when connected to the 98028A Mux via the 50-pin cable or a 15-pin port. Series 300 systems have ample power for any configuration supported by software. The maximum number of 98028A Muxes that a single Series 200 computer can power is generally limited to half the number of I/O slots the computer has. This number may be further reduced by other cards in the backplane.
- The HP27123A SRM interface for the Series 500 computers is capable of powering a 98028A. The HP98029A interface for the HP9835 and 9845 computers cannot power a 98028A.
- The computer supplying power to the 98028A Mux need only be powered up and need not be executing an operating system (unless, of course, that computer is the SRM controller). For example, a Model 226 computer may be used to power the 98028A while executing HPL even though HPL does not support SRM communications. A 9888A bus extender (with no computer attached) may also be used.

98629A Materials Supplied

Description	98629A	Order Separately
Series 300 BASIC 4.0 SRM Access software	-	Standard w/BASIC
Series 300 HP-UX SRM Access software	-	98693A Option 022, 045
Series 300 Pascal 3.1 SRM Access software	-	Standard w/Pascal
98629A interface card	Included	NA
SRM Multiplexer	-	98028A
SRM multiplexer cable	-	97061A/B/C/D

98629A/Series 300 Operating System Information

Refer to 50961A in this appendix.

98629A Ordering Information

98629A	SRM/MUX interface
5061-4247	Test connector
7121-1957	Select code labels (one set included w/98629A)
97061A	10m SRM cable
97061B	25m SRM cable
97061C	60m SRM cable
97061D	60m SRM cable, unterminated (includes connectors)
98028A	SRM multiplexer
98629-90021	Installation manual (one included w/98629A)
98693A	HP-UX SRM Access software (see 98693A in this appendix)

98630A Breadboard Interface Card

The 98630A is a prototyping board which facilitates the design of custom interface cards by experienced hardware designers. It consists of an "I/O"-style card with the necessary HP-DIO backplane buffering circuits and a 96 sq. cm area of tinned holes on 0.1-in. centers.

Option 001 provides a 98630-66502 HP-DIO service extender card for easier testing of a card operating outside the card cage. The 98630-66502 is available separately (via that part number) and is the preferred service extender card for Series 200 and 300 computers.

98630A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98630A	Breadboard interface	Note	Unsup.	Unsup.	4.0	Unsup.	3.1

- The card's HP-DIO "ID" is user-definable. If it is set to one of the pre-allocated "custom card" values (15 or 16), the boot ROM will report and ignore it. If it is set to the same value as an HP-supplied card, unpredictable results may occur.
- Hardware regulatory qualification is the responsibility of the card designer. HP cannot offer support services on user-designed hardware.

98630A Specification Summary

Prototyping area	62 × 26 holes on 0.1-in centers
Maximum component height	10mm
Voltages available	+5, ±12 Vdc
Peripheral connector	None - cover plate is blank
Interrupt levels	per user-provided switch
Select codes	per user-provided switch
Read registers provided	one 5-bit "ID", and one 8-bit interrupt & DMA status with 2 user-defined bits
Write registers provided	one 1-bit reset, and one 8-bit interrupt & DMA enable with 5 user-defined bits
DMA circuitry	User-provided

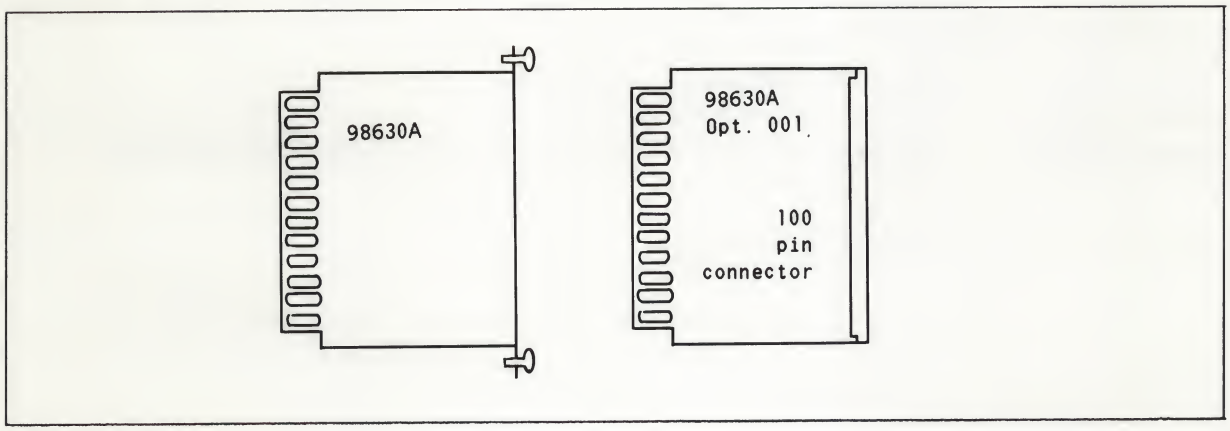
98630A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98630A	Breadboard interface	1	Yes	None: 0 to 31	Yes	Opt.

- For applications not requiring an external connection, the card may be used without the cover plate (i.e. as an "accessory" card).
- Select codes 15 and 16 are reserved for user-designed I/O cards. The use of select codes below 8, and "internal" address space are not recommended.
- Compatibility with the 9888A expander must be determined by testing.
- Use with DMA requires user-provided circuitry.

98630A/Series 300 Interfacing

Interfacing is entirely user-defined.



98630A/Series 300 BASIC Interfacing

No "driver" is supplied for the 98630A. Unless the card is designed to emulate a supported HP card, I/O will probably be limited to the use of the READIO and WRITEIO statements, or CSUBs that directly access card register addresses. BASIC does allow interrupts from unrecognized I/O cards. The "IO" binary is required for ON INTR processing.

98630A/Series 300 HP-UX Interfacing

It may be possible to program and read data from the 98630A card in HP-UX by using the "iomap" driver (10). Registers would be accessed as offsets from the base address returned by *ioctl*. This has not been tested. Interrupts cannot be serviced and DMA cannot be used.

Driver required	`iomap`
Block-mode major number	NA
Character-mode major number	10

98630A/Series 300 HP-UX Driver Minor Number

Bits	23-08	7-0
Fields	Address/0x10000 or Select Code+0x060	64 Kbyte Regions
Values (hex)	0060 to 007F	01 to FF

Typical *mknod* for a user-designed card at select code 15:

```
# mknod /dev/adc    c 10 0x006f01
```

98630A/Series 300 Pascal Interfacing

No "driver" is supplied for the 98630A. The **Pascal System Internals Documentation** (ordered separately) documents how to write a Pascal driver, and includes additional information on the design of HP-DIO cards.

98630A Ordering Information

98630A	Breadboard interface card
Option 001	Adds 98630-66502 service extender
7121-1957	Select code labels (one set included w/98630A)
98615-87970	Pascal System Internals Documentation
98630-66502	HP-DIO service extender card
98630-90000	98630A Installation and Programming manual (one included w/98630A)

98633A Multiprogrammer Interface Card

The 98633A is a custom interface card for the HP 6944A Series 200 Multiprogrammer. It is an HP-DIO "I/O"-style card and is user-installable.

The 98633A is a special-purpose GPIO card and is supported only by the 14752A Multiprogrammer software. The 98633A is not compatible with the 6940A/B or 6942A Multiprogrammers. They require the 98622A Option 003 and 98624A interfaces, respectively.

98633A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98633A	Multiprogrammer interface	Rev. A	Yes	Yes	4.0	Unsup.	Unsup.

Boot ROM revision A only identifies the 98633A card.

98633A Specification Summary

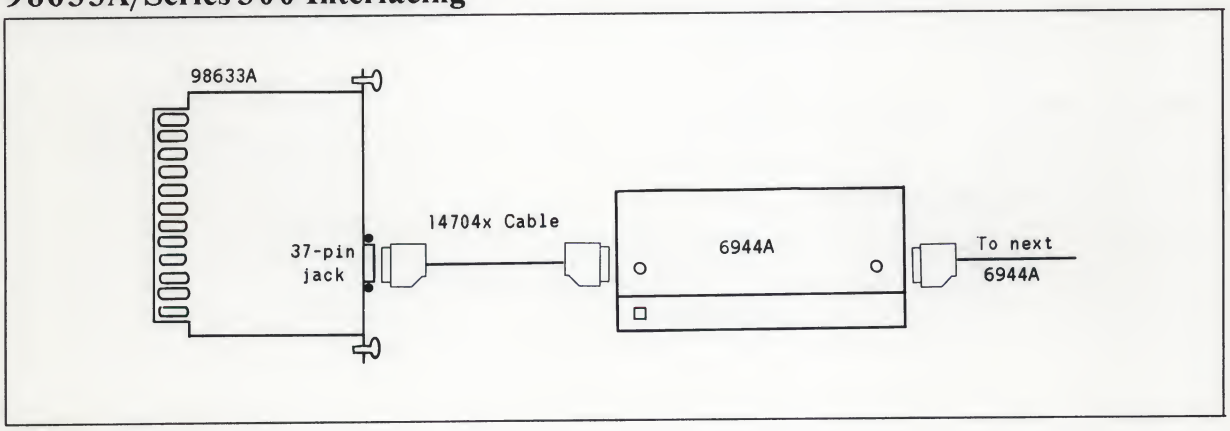
Data sheet (for complete specs.)	5953-_____
Peripheral connector	37-pin pin-and-socket
Interrupt levels	3...6
BASIC performance using 14752A	
Single point transfer time	1.5ms input, 1.4ms output
Minimum interrupt response time	13.2ms
Maximum block transfer rate	30 KHz without DMA 180 KHz with DMA
Block transfer overhead	2.5ms entry, 0.2ms exit

98633A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98633A	Multiprogrammer interface	1	Yes	29: 8 to 31	Yes	Opt.

Note - The default select code address (29) conflicts with the higher of the two default select codes used by the 98627A card (28 and 29).

98633A/Series 300 Interfacing



98633A Switches & Jumpers	Sample Configuration	Comments
Select code	29	Factory default
Interrupt level	3	Recommended

14704x Cables Available

Product	Length
14704A	1 m
14704B	2 m
14704C	4 m

The maximum total length of all 14704 cables on one 98633A interface is nine metres.

98633A/Series 300 BASIC Interfacing

Typical device specifiers	29
Binaries required	GPIO
Binaries optional	IO, TRANS
Programming required	Provided by 14752A library

98633A/Series 300 HP-UX Interfacing

It may be possible to program and read data from the 98633A card in HP-UX by using the "iomap" driver (10). Registers would be accessed as offsets from the base address returned by *ioctl*. This has not been tested. Interrupts cannot be serviced and DMA cannot be used. It may also be possible to use the "`gpio`" driver. This also has not been tested.

Driver required	`iomap`
Block-mode major number	NA
Character-mode major number	10

98633A/Series 300 HP-UX Driver Minor Number

Bits	23-08	7-0
Fields	Address/0x10000 or Select Code+0x060	64 Kbyte Regions
Values (hex)	0060 to 007F	01

Typical *mknod* for a 98633A card at select code 29:

```
# mknod /dev/6944    c 10 0x007d01
```

98633A/Series 300 Pascal Interfacing

It may be possible to access the 98633A card using the GPIO driver. This has not been tested.

98633A Ordering Information

98633A	Multiprogrammer interface card
7121-1957	Select code labels (one set included w/98633A)
06944-90001	Installation and Service Manual (one included w/6944A)

98635A Floating Point Math Card

The 98635A adds IEEE-compatible hardware floating point processing to Series 200 computers and the Model 310 computer. It is an HP-DIO "accessory"-style card and is user-installable.

98635A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98635A	floating point card	Rev. A	Yes	Yes	4.0	5.0	3.1

- Boot ROM revision A identifies the 98635A card.
- Although the 98635A is compatible with the Model 320, the built-in MC68881 coprocessor of the Model 320 provides much higher floating point performance in all systems.

98635A Specification Summary

Maxium 98635As per computer	1
Numeric formats	IEEE P754/D2 proposed standard, 32- and 64-bit

98635A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98635A	Floating point card	1	No	None	Yes	No

Performance of the 98635A decreases by approximately 20% if installed in a 9888A bus expander. The 98635A should be installed in the computer mainframe or a 98568A expander.

98635A/Series 300 Interfacing

The 98635A has no cabling and may be installed in any available HP-DIO slot (subject to the previously mentioned performance considerations when used in a 9888A expander).

98635A/Series 300 BASIC Interfacing

When a 98635A is present, BASIC transparently selects it for floating point computations (unless an MC68881 is also present). You can disable the 98635A with a `CONTROL 32,2;0` statement.

Typical device specifier	32 (control/status register)
Binaries required	None
Binaries optional	None
Programming required	None

98635A/Series 300 HP-UX Interfacing

Code optimized for the 98635A is not automatically generated by Series 300 HP-UX compilers. The following steps are required for each language:

C	`cc -f` at compile time
FORTRAN77	`f77 -f` at compile time
Pascal	`$FLOAT_HDW ON$` or `$FLOAT_HDW TEST$` directive in your source

98635A/Series 300 Pascal Interfacing

If there is a `$FLOAT_HDW ON$` or `$FLOAT_HDW TEST$` directive in the source code, the standard "COMPILER" generates the appropriate optimized code. The alternate "COMPILER20" generates only MC68881 optimized code. There are also three versions of the DGL graphics library:

"GRAPHICS" was compiled with "$FLOAT_HDW TEST$ and the standard COMPILER
"FGRAPHICS" was compiled with "$FLOAT_HDW ON$ and the standard COMPILER
"FGRAPH20" was compiled with "$FLOAT_HDW ON$ and COMPILER20

98635A Ordering Information

98635A	Floating point card
98635-90000	Installation Manual (one included w/98635A)

98640A Analog Input Interface

The 98640A is a plug-in analog to digital converter (ADC) for Series 200 and 300 computers. It provides seven differential unguarded 13-bit analog channels with programmable ranges from an LSB of 4.77 μV to $\pm$10V full scale. The scanning and sampling rate is also programmable up to 55 000 readings per second. A calibration channel is also available as an eighth data channel where offset accuracy is not critical. The 98640A is an HP-DIO "I/O"-style card and is user-installable.

The 98640A is normally accessed via the 98645A Measurement Library (ordered separately - see 98645A in this appendix). The 98640A includes diagnostic software.

98640A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98640A	ADC interface card	Rev. A	Yes	Yes	4.0	Unsup.	3.1

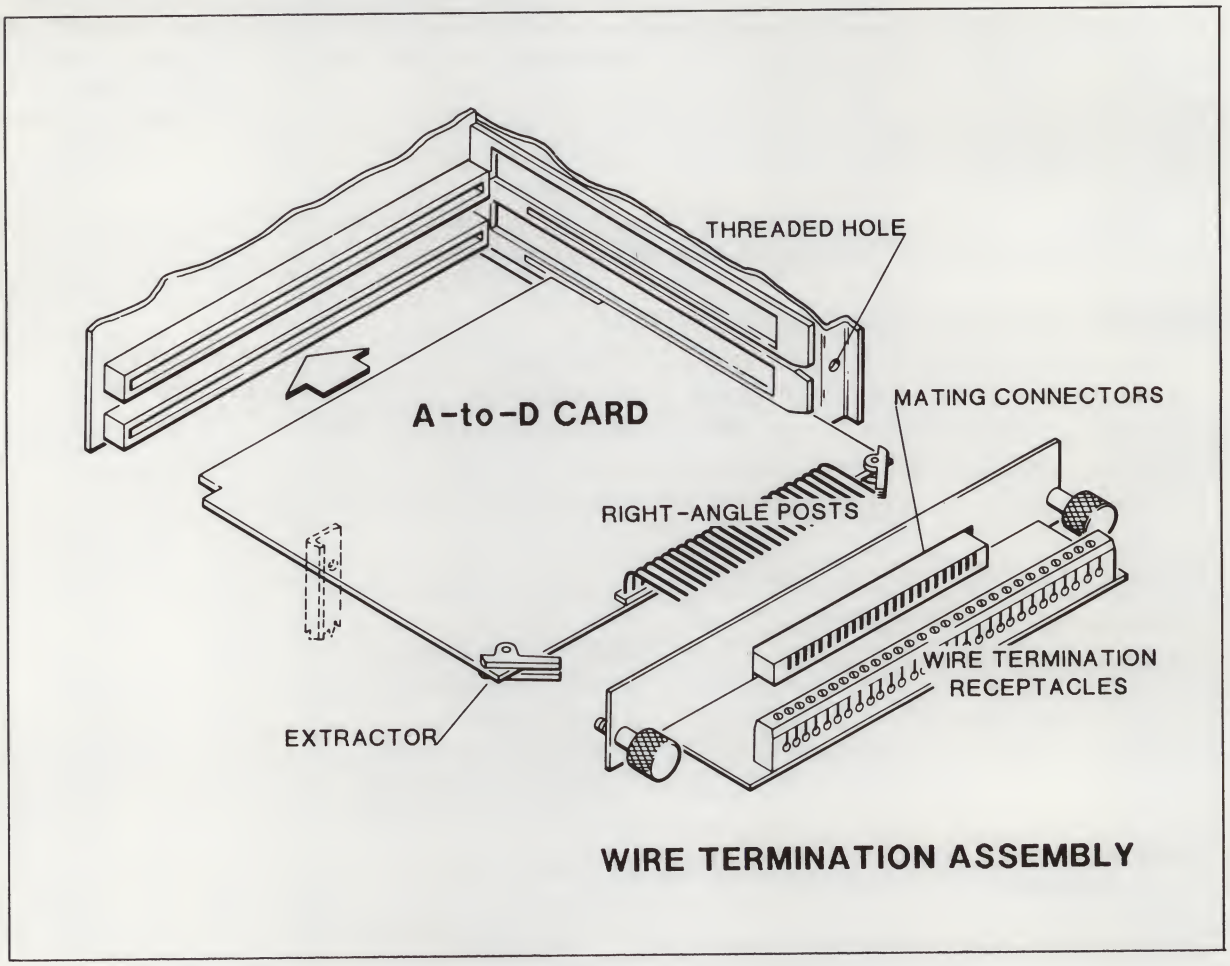
Boot ROM revision A support of the 98640A is limited to identifying the card.

98640A Specification Summary

Data sheet (for complete specs.)	5954-6312
Peripheral connector	Molex pin and socket or screw terminations (included)
Input/output data lines	8 analog input
Handshake, status and control lines	1 external pace input 1 internal pace disable 1 +5 Vdc, 50 mA source
Interrupt levels	3...6
Input channels	7 or 8
Resolution	12 data bits, 1 sign bit
Full scale range and LSB at each gain	1: $\pm$10V, 2.44mV LSB 8: $\pm$1.25V, 305mV LSB 16: $\pm$156mV, 38.1 μV LSB 64: $\pm$19.5mV, 4.77 μV LSB
Input resistance (each channel)	100 megohms (power on) 1 Kohm (power off)
Resolution of internally clocked pace rate	600nS
Sample and hold aperture time	25nS
Minimum sample cycle	18 μS
Maximum sample rates	Single channel 55 000/sec. Across channels: 20 000/sec @ 1 or 8 gain, 14 000/sec @ 64 gain, 1000/sec @ 512 gain
Linearity	0.02% of full scale
Temperature coefficient for voltage offset	10 μV/C°
Common-mode rejection ratio (CMRR)	90dB @ 60Hz

98640A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98640A	ADC interface card	1	Yes	18: 8 to 31	Yes	No



98640A Switches & Jumpers	Sample Configuration	Comments
Select code	18	Factory default
Interrupt level	3	Factory default

98640A/Series 300 BASIC Interfacing

The 98645A library had not been re-compiled and tested in BASIC 4.0 at time of publication. If the 98645A Measurement Library is not used, all programming of the 98640A is accomplished via CONTROL, STATUS, READIO and WRITEIO statements.

Typical device specifier	18
Binaries required	None
Binaries optional	IO
Programming required	Extensive unless library used

98640A/Series 300 HP-UX Interfacing

It may be possible to program and read data from the 98640A card in HP-UX by using the "iomap" driver (10). Registers would be accessed as offsets from the base address returned by *ioctl*. This has not been tested. Interrupts cannot be serviced and DMA cannot be used.

Driver required	`iomap`
Block-mode major number	NA
Character-mode major number	10

98640A/Series 300 HP-UX Driver Minor Number

Bits	23-08	7-0
Fields	Address/0x10000 or Select Code+0x060	64 Kbyte Regions
Values (hex)	0060 to 007F	01

Typical *mknod* for an ADC card at select code 18:

```
# mknod /dev/adc    c 10 0x007200
```

98640A/Series 300 Pascal Interfacing

The 98645A library is composed of compiled Pascal (CSUBs). They are provided in a Pascall-callable form as well as in BASIC CSUB form.

Default volume	None
Modules required	None
Programming required	Extensive unless library used

98640A Ordering Information

98640A	Analog input interface
Option 001	Delete diagnostic hood and diagnostic software
Option 016	Add metal shield for use with Model 216
Option 630	Diagnostic software on 3½-in. single sided discs
Option 655	Diagnostic software on 5¼-in. discs
7121-1957	Select code labels (one set included w/98640A)
98640-60001	Shield for use of 98640A in Model 216 computer
98640-66502	Screw termination assembly (one included w/98640A)
98640-67950	Test hood assembly (one included w/98640A)
98640-90001	Installation and Reference manual (one included w/98640A)

98642A RS-232C Multiplexer

The 98642A is a four-channel EIA RS-232C (CCITT V.28) multiplexer interface for the Series 200/300 computers. The 98642A has three direct-connect ports and one port with full modem control. If you have not chosen an RS-232C interface, also refer to the 98626A, 98628A and 98644A sections. The 98642A is the most economical RS-232C interface on a per-port basis.

The buffering of the 98642A makes it suitable for nearly all applications, including graphics terminals. The 98642A is user-installable.

98642A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98642A	RS-232C interface	Rev. A	Yes	Yes	No	5.0	No

The revision A boot ROM supports port 1 (only) of the 98642A as an alpha device (console display and keyboard) if the REMOTE switch is set. The boot ROM sets the card to 9600 baud, 8 bits/character, no parity, one stop bit and Xon/Xoff handshaking.

European datacomm certification was still in progress at time of publication. Check with your local HP Sales or Service office before connecting the modem port of the 98642A directly to a public network.

98642A Specification Summary

Data sheet (for complete specs.)	5954-6312
Electrical interface	EIA RS-232C, CCITT V.28
Number of ports	4 (1 modem, 3 direct-connect)
Data rates (bps)	110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200
Input/output buffer size	128/16 bytes per port
Character size	7 or 8 bits
Parity	Odd, Even, None
Stop bits	1 or 2 (6...8 bits/char)
Hardware handshake	Provided by HP-UX per *tty(4)*
Software handshake	Provided by HP-UX per *tty(4)*
Interrupt level	3...6 (default 3)

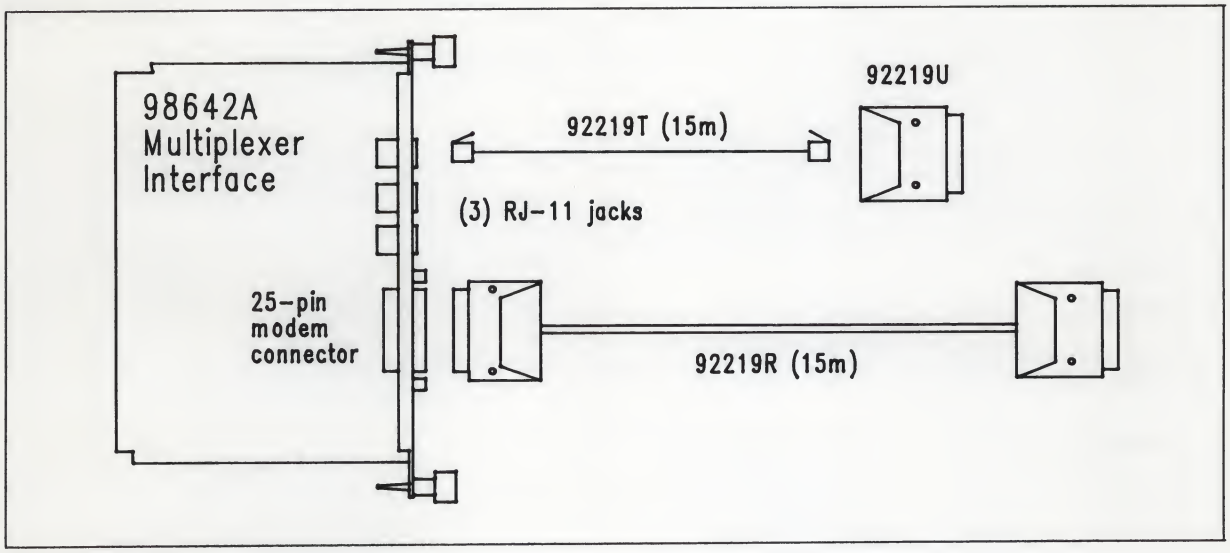
Aggregate MUX throughput is card-limited to 76800 bps continuous input data. A busy system may further reduce this figure, but no data loss should occur if a handshake (such as host-initiated Xon/Xoff receive pacing) is used.

98642A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98642A	RS-232C MUX interface	1	Yes	13: 8 to 31	Yes	No

98642A/Series 300 Interfacing

The 98642A is supplied with a 5m 92219S modem cable for port 0 (the modem port), and three 92219T RJ11-to-RJ11 cables with 92219U RJ11-to-25-pin (male) adaptors.



98642A Switches	Sample Configuration	Comments
Select code	13	
Console	Local Remote	If ITE present and is console If terminal on RJ11 port1 is console
Interrupt level	3	

All other port parameters must be set under software control.

98642A Host Connections Provided

Interface Connector	Con-nector	Cable	Con-nector	Con-nector	Cable or Device	Con-nector	Provides Host Connection Type
Port 0 25F	-	-	-	-	-	-	DIR25(F)
25F	25M	13242G (5m) or 92219R (15m)	25M	-	-	-	DIR25(M)
25F	25M	92219S (5m) or 92218A (15m) or 92222M (.2m)	25M	-	-	-	DTE(M)
25F	25M	92219S	25M	25F	13232U	25F	DCE(F)
25F	25M	92219S	25M	25F	Modem~Modem	25F	DCE(F)
Ports 1-3 RJ11(F)	RJ11(M)	92219T +92219U	25M	-	-	-	DIR25(M)

"DIR25(M)" and "DIR25(F)" are not EIA standard notation. These designations indicate that pins 2 and 3 are reversed (compared to normal DTE(M) and DCE(F) wiring) and that these connection types should only be used where a direct-connect 3-wire circuit (transmit, receive and ground) is acceptable. All other RS-232C lines, especially the modem control lines, may not be usefully connected (if connected at all) from the peripheral to the interface when "DIR" cabling is used.

98642A Peripheral Connections Available

Host Type Required	Con.	Peripheral Cable	Con.	Con.	Peripheral
DIR25(M)	-	-	-	25F	HP 150(all), 2625A, 2628A, 2624B port 2 terminal
DCE(F)	25M	13242N (5m) or 92218A (15m) or 92222M (.2m)	25M	25F	HP 150(all), 2625A, 2628A, 2624B port 2 terminal
DCE(F)	25M	40242M(5m)	25M	25F	2392A, 2393A, 2397A terminal
DIR25(M)	25F	40242C(5m)	25M	25F	2392A, 2393A, 2397A terminal
DIR25(F)	25M	40242G(5m)	25M	25F	2392A, 2393A, 2397A terminal
DIR25(M)	-	-	-	25F	2601A daisywheel printer
DCE(F)	25M	13242N (5m) or 92218A (15m)	25M	25F	2601A daisywheel printer
DIR25(M)	25F	13222C	50M	50F	2622A, 2623A, 2627A 2624B port 1 terminals
DIR25(F)	25M	13222Y (5m) or 92217D (15m)	50M	50F	2622A, 2623A, 2627A, 2624B port 1 terminals
DCE(F)	25M	13222N (5m) or 92217A (15m)	50M	50F	2622A, 2623A, 2627A 2624B port 1 terminals
DIR25(M)	25F	13232C (5m) or 92219D (15m)	48F	48M	2647F terminal
DCE(F)	25M	13232N (5m) or 92219B (15m)	48F	48M	2647F terminal
DTE(M)	25F	17255D (5m)	25M	25F	2686A *LaserJet* printer
DIR25(M)	-	-	-	25F	2686A *LaserJet* printer
DTE(M)	<none required>			25F	37212A Modem
DCE(F)	25M	8120-3258	25M	25F	39800/01A Bar Code Reader
DCE(F)	25M	92221M (1.5m)	9M	9F	45710/11A *Portable* PCs
DTE(M)	<none required>			25F	92205A/C Modem
DCE(F)	25M	82974A (1.5m)	25F	25M	9807A *Integral* PC
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	9816 built-in RS-232C or 9817* built-in
DTE(M)	25F	5061-4216 (4.9m)	50M	50F	9816 built-in RS-232C or 9817* built-in
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	98626A* or 98628A* interfaces
DTE(M)	25F	5061-4216 (4.9m)	50M	50F	98626A* or 98628A* interfaces
DIR25(M)	-	-	-	25F	98644A* or 98561-66511/12/13* Model 310 built-in
DCE(F)	25M	13242N (5m) 92218A (15m) 92222M (.2m)	25M	25F	98644A* or 98561-66511/12/13* Model 310 built-in
DCE(F)	25M	92221M (1.5m)	9M	9F	98561-66530 Model 320*

* This cabling is suitable for use of the remote computer as a terminal only. For use in *uucp* communications (or both), see the *uucp* discussion in this section.

98642A/Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1

98642A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-12	11-8	7-4	3	2	1	0
Fields	Select Code	Not Used	Port Number	Not Used	NA	Access Type: Line	Access Type: Modem	Access Type: Direction
Values (hex)	07 to 1F	0	0 to 3	0	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod*s for a 37212A modem on port 0 and terminals on ports 1, 2 and 3 of a 98642A interface at select code 13.

```
# mknod /dev/tty01  c 1 0x0d0004
# mknod /dev/cul01  c 1 0x0d0001
# mknod /dev/cua01  c 1 0x0d0001
# mknod /dev/tty02  c 1 0x0d0100
# mknod /dev/tty03  c 1 0x0d0200
# mknod /dev/tty04  c 1 0x0d0300
```

Series 300 UUCP Connections

This discussion applies to all Series 300 RS-232C interfaces.

Unlike a simple RS-232C terminal or printer connection, *uucp* networking relies on modem handshake lines. Consequently, while the "real-modem" computer-to-computer case is straightforward, the "hardwired" case is not.

- For *modem* communciation between two HP-UX systems, specify for each computer:
  - a serial interface having modem control lines;
  - a cable which provides a DTE host connection type;
  - a supported modem, such as HP37212A or 92205A/C. If the modems on each end are not the same make and model, independently confirm that they are compatible (a topic presently beyond the scope of this manual).
- For *hardwired* communication between two HP-UX systems, specify a set of components from the following table. The "Special" entry refers to a user-fabricated cable. Details follow the table. The connection may require as many as three cables.
- For the built-in RS-232C interface of the Model 217 computer, use the 98626A cabling. The 98626A Option 001 cable is the 5061-4215.
- For the built-in RS-232C interface of the Model 310 computer (98561-66511/12/13 boards), use the 98644A cabling.
- For the built-in RS-232C interface of the Model 320 computer (98561-66530 human interface card), use the 98644A configurations, but substitute a 92221M cable for the 13242N.

Hardwired UUCP Connections

Remote Adaptor Local	Series 500 27128A	Series 500 27130A/B	Series 500 27140A	Series 200 Series 300 98626/28A	Series 200 Series 300 98642A Port 0, 98644A	*Integral PC* 82919A
27128A	Opt.001 Special Opt.001	- - Opt.001	92219Q Special Opt.001	Opt.001 Special Opt.001	13242N Special Opt.001	82974A Special Opt.001
27130A/B	Opt.001 - -	- 13242G -	92219Q - -	Opt.001 - -	13242N - -	82974A - -
27140A	Opt.001 Special 92219Q	- - 92219Q	92219Q Special 92219Q	Opt.001 Special 92219Q	13242N Special 92219Q	82974A Special 92219Q
98626/28A	Opt.001 Special Opt.001	- - Opt.001	92219Q Special Opt.001	Opt.001 Special Opt.001	13242N Special Opt.001	82974A Special Opt.001
98642A Port 0, 98644A	Opt.001 Special 13242N	- - 13242N	92219Q Special 13242N	Opt.001 Special 13242N	13242N Special 13242N	82974A Special 13242N
82919A	Opt.001 Special 82974A	- - 82974A	92219Q Special 82974A	Opt.001 Special 82974A	13242N Special 82974A	82974A Special 82974A

This "Special" cable referenced above is not presently available from HP. You can fabricate it from an HP92178B connector kit (a pair of 25-pin female RS-232C connectors) and 92179A cable. The pin-outs required are:

Special Hardwired UUCP Cable Description

Signal	Pin		Pin	Signal
protective ground	1	———	1	protective ground
SD (transmitted data)	2	———	3	RD
RD (received data)	3	———	2	SD
signal ground	7	———	7	signal ground
CD (carrier detect)	8	———	20	TR
TR (terminal ready)	20	———	8	CD

98642A Ordering Information

98642A	RS-232C 4-channel asynchronous multiplexer
Option 001	Delete all cables and connectors
13242G	5m "printer" cable (male-to-male, reverses pins 2&3, but is generally suitable only for direct-connect peripheral use in HP-UX)
13242N	5m male DTE cable
13232U	1.5m "modem eliminator" cable (female-to-female, reverses pins 2&3, but is generally suitable only for direct-connect peripheral use in HP-UX)
5957-9918	Terminal cabling manual
7121-1957	Select code labels (one set included w/98642A)
92178A	Male 25-pin RS-232C connector kit (2 connectors)
92178B	Female 25-pin RS-232C connector kit (2 connectors)
92178C	Male & Female 25-pin RS-232C connector kit (one each)
92218A	15m male DTE cable
92219R	15m male-to-male 25-pin direct-connect cable
92219S	5m male DTE cable (one included w/98642A)
92219T	15m RJ11-to-RJ11 cable (three included w/98642A)
92219U	RJ11-to-25-pin(M) adaptor (three included w/98642A)
92222M	0.2m male DTE cable
92234X	*The RS-232 Solution* - Campbell
98642-67950	RJ11 test hood
98642-90001	Installation manual (one included w/98642A)
98644-67950	25-pin test hood

98643A LAN/300 Link

The 98643A LAN/300 Link (Interface) is used by the 50951/52A Series 300 and 50956/57A Series 200 HP-UX software to communicate via Local Area Network (LAN) with Series 200, 300, 500, HP 3000, and other HP computers which support *AdvanceNet* protocol. A single LAN link may have up to 100 nodes.

98643A Compatibility with other Systems

Remote System / Network Service	Series 200/300 w/98643A	Series 500 w/27125A/B	Series 500 w/2285A§	HP 3000
NFT - Network File Transfer	YES	YES	YES§	YES
RFA - Remote File Access	YES	YES	YES§	NO
RPM - Remote Process Management	NO	NO	NO§	NO
IPC - Interprocess Communication	NO	NO	NO§	NO

Link level access is also available for 98643A customers having the expertise to write inter-vendor LAN software. The 98643A supports either "ThinLAN" (RG58) cable or "Backbone" thick cable, depending on the Medium Access Unit (MAU) chosen.

The 98643A is an HP-DIO "I/O"-style card and is is user-installable. This section documents the use of the 98643A LAN interface. Software and software support service ordering information is provided in the 50951/52A or 50956/67A section of this appendix.

Because only a single 98643A card is supported in a given computer, it is not possible to configure a Series 200 or 300 system as a "gateway" between two LAN networks, nor is any software provided for this purpose.

98643A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98643A	LAN/300 interface	Rev. A	Yes	Yes	No	5.0*	No

Revision A boot ROM support is limited to card identification.

§ 2285A-based systems must be upgraded to HP-UX 5.0 and 50953/54 software. The 2285A supports only "backbone" thick LAN cable.

* Requires 50951A or 50952A NS/9000 software.

98643A Specification Summary

Data sheet (for complete specs.)	5954-6312
Physical transport protocol	IEEE 802.3 or Ethernet™ 1.0
Transmission mode	Baseband digital
Access method	CSMA/CD
Impedance	50 ohms
MAU power available	0.5A @ 12 Vdc
Buffering	16 Kbytes
ThinMAU (included w/98643A Std.)	28641A
Dimensions	25mmH, 75mmW, 30mmD
Weight	0.45 kg
ThinLAN coax cable type	IEEE 802.3 Type 10 Base 2 (RG-58)
Maximum cable length	185m
Minimum distance between nodes	0.5m
Maximum AUI cable length	1.0m
Maximum nodes	30
Link data rate	10 Mbits/sec.
"Backbone" MAU	30241A
Dimensions	30mmH, 310mmW, 95mmD
Tap	25mmH, 75mmW, 30mmD
Backbone coax cable type	IEEE 802.3 Type 10 Base 5
Maximum cable length	500m
Minimum distance between nodes	2.5m
Maximum AUI cable length	48m
Maximum nodes	100
Link data rate	10 Mbits/sec.
Maximum 98643As per system	1
Interrupt levels	3...6

98643A HP-DIO Characteristics

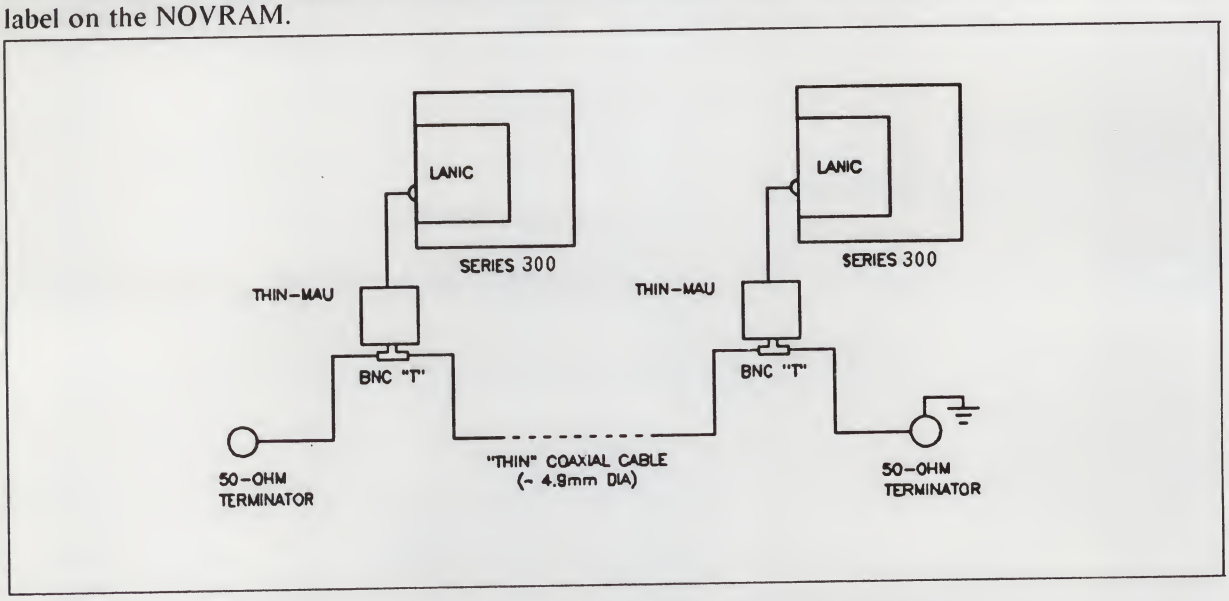
Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98643A	HP LAN/300 interface	1	Yes	21: 8 to 31	Yes	No

The factory default address of 21 is the same as the 50961A#200 and 98629A SRM interface cards. Change it if both types of card are present (HP-UX only).

Ethernet™ is a trademark of the Xerox Corp.

98643A/Series 300 Interfacing

The Link Address of the 98643A is stored in a non-volatile RAM (NOVRAM) on the card. The address is hex "080009xxyyzz", where "xxyyzz" is unique to each 98643A card and is found on a label on the NOVRAM.



98643A Switches	Sample Configuration	Comments
Select Code	21	Factory default (unless SRM present)
Mode	IEEE	or *Ethernet* (a jumper)
Interrupt level	5	Required

You need the following components to connect a Series 300 computer to a ThinLAN:

- 98643A LAN/300 Link card (includes ThinMAU and BNC tee).
- 50951A (single-user) or 50952A (multi-user) *Network Services/9000* software. One copy of this software is required for each Series 300 computer. NS/9000 software is not included with the 98643A. Refer to 50951/52A for ordering information.
- One HP28461A LAN Medium Access Unit (ThinMAU) with integral 1.0m AUI cable and BNC tee connector. The standard 98643A product includes a 28641A.
- A new or existing ThinLAN cable. ThinLAN cable is available from HP as any of several 92227x products (see ordering information).

  If you are using unconnectored LAN cable, or cutting into an existing cable, also order one 92227L BNC connector kit (one pair). If this is the first unconnectored HP node on the site, order a 92227M ThinLAN tool kit and a set of BNC connectors (92227P).

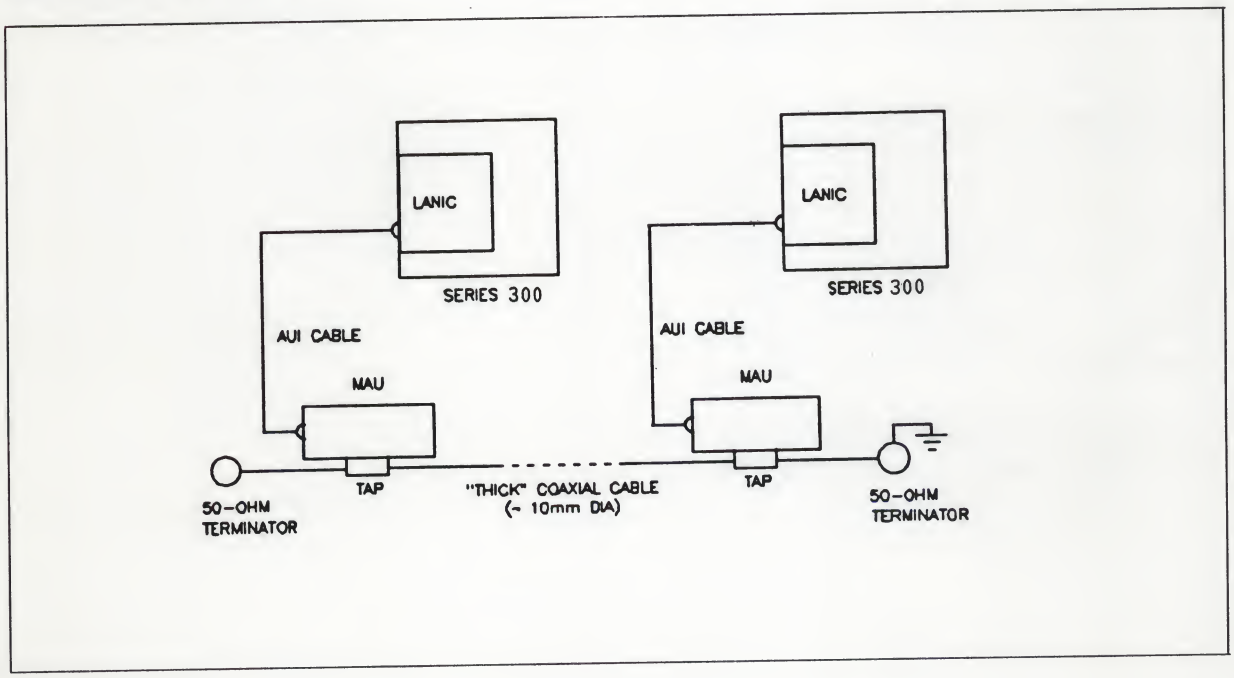
You need the following components to connect a Series 300 computer to a "backbone" (thick) LAN:

- 98643A Option 241 LAN/300 Link card.
- 50951A (single-user) or 50952A (multi-user) *Network Services/9000* software. One copy of this software is required for each Series 300 computer. NS/9000 software is not included with the 98643A. Refer to 50951/52A for ordering information.
- Up to 48m of Attachment Unit Interface (AUI) cable (sometimes referred to as transceiver or "branch" cable) to connect the 98643A to the Medium Access Unit (MAU). 98643A Option 241 does not include an AUI cable. Order any of several 92254x products (see ordering information).

  If you order cut-to-length (unconnectored) AUI cable, also order one 92255C AUI Connector Kit. If this is the first unconnectored AUI cable at your site, also order one 92256B AUI Cable Assembly Tool Kit.
- One HP30241A LAN Medium Access Unit (MAU) and Tap. 98643A Option 241 does not include a MAU.
- A new or existing LAN cable. LAN cable is available from HP as any of several 92253x products. If this is the first HP node on the LAN, also order an HP92256C MAU and Tap Installation Tool Kit. Connectored HP LAN cables include the 50 ohm connectors. A complete listing of LAN cables and accessories is available in the **Computer Users Catalog**, *(HP Pub. No. 5953-2450)*, Spring/Summer 1985 or later edition.

  If you are using unconnectored LAN cable, also order one 92229B N-connector crimp tool and one 92256A LAN coax cable installation kit for the site. The HP unconnectored LAN cables include connectors and the 50 ohm connectors.

HP "backbone" AUI and LAN cables are available with either FEP (Teflon™) or PVC (Polyvinyl Chloride) jackets. Consult local Codes prior to selecting jacket type. AUI cable has a minimum bend radius of 5 inches.



Materials Supplied

Description	98643A Standard	98643A Opt. 241	Order Separately
NS/9000 HP-UX Software, single-user	-	-	50951A
NS/9000 HP-UX Software, multi-user	-	-	50952A
LAN/300 interface card	Included	Included	NA
AUI cable, connectored, PVC 1.0m	Included	-	Part of 28641A
ThinMAU (Medium Access Unit) & BNC tee	Included	-	28641A
ThinLAN cable, PVC, connectored, 1/2/4/8m	-	-	92227A/B/C/D
ThinLAN cable, PVC, connectored, 16/32/64/128m	-	-	92227E/F/G/H
ThinLAN cable, PVC, unconnectored	-	-	92227J
ThinLAN cable, FEP, unconnectored	-	-	92227K
ThinLAN BNC connector pair for one 92227J/K	-	-	92227L
Facility ThinLAN BNC tool kit for 92227J/K	-	-	92227M
ThinLAN connector pair	-	-	92227P
AUI cable, connectored, FEP, 6/12/24/48m	-	-	92254A/B/C/D
AUI cable, connectored, PVC, 6/12/24/48m	-	-	92254E/F/G/H
AUI cable, unconnectored, FEP, 15...500m	-	-	92255A
AUI cable, unconnectored, PVC, 15...500m	-	-	92255B
Connector kit for one 92255A/B cable	-	-	92255C
Facility AUI tool kit for 92255C kit	-	-	92256B
MAU (Medium Access Unit) and Tap	-	-	30241A
Tap only	-	-	30241B
Facility LAN toolkit for 92253 cable	-	-	92256A
Facility MAU and Tap installation tool	-	-	92256C
Facility N-con. crimp tool for 92253 LAN cable	-	-	92229B
LAN cable, FEP, connectored, 23.4m	-	-	92253B
LAN cable, PVC, connectored, 23.4m	-	-	92253F
LAN cable, FEP, unconnectored, 23.4/117/500m	-	-	92253A/C/D
LAN cable, PVC, unconnectored, 23.4/117/500m	-	-	92253E/G/H

98643A/Series 300 HP-UX Interfacing

Drivers required	`ethernet, ieee802`
Block-mode major number	NA
Character-mode major number	18 (ieee802) 19 (ethernet)

98643A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-0
Fields	Auto-probe	Not Used
Value (hex)	1F	0000

Typical *mknod* for 98643A at select code 21 on an IEEE-802 LAN.

```
# mknod /dev/lan   18 c 0x150000
```

98643A Ordering Information

98643A	LAN/300 Link card
Option 241	Delete 28641A ThinMAU and AUI cable
30242-90002	LAN Cabling and Installation Guide
5955-7680	LAN Cable and Accessories Installation Manual
5955-7681	LAN Link Troubleshooting Manual
5957-4624	Making the LAN connection
7121-1957	Select code labels
92233V	*Computer Networks* - Tanenbaum
92234V	*A Managers Guide to Local Networks* - Derfler and Stallings
98643-90001	Installation manual (one included w/98643A)
	ThinLAN Components
1250-0781	BNC "tee" without boot (one included w/standard 98643A)
1250-1152	Plastic insulating boot (one included w/standard 98643A)
28641A	ThinMAU and 1.0m AUI cable (one included w/standard 98643A)
92227A	1m PVC ThinLAN coax cable, BNC connectored
92227B	2m PVC ThinLAN coax cable, BNC connectored
92227C	4m PVC ThinLAN coax cable, BNC connectored
92227D	8m PVC ThinLAN coax cable, BNC connectored
92227E	16m PVC ThinLAN coax cable, BNC connectored
92227F	32m PVC ThinLAN coax cable, BNC connectored
92227G	64m PVC ThinLAN coax cable, BNC connectored
92227H	128m PVC ThinLAN coax cable, BNC connectored
92227J	PVC ThinLAN coax cable, unconnectored (specify length)
92227K	FEP ThinLAN coax cable, unconnectored (specify length)
92227L	BNC connectors, male, one pair
92227M	BNC tool kit (one per facility recommended)
92227N	BNC tee connector with cover (one included w/std. 98643A)
92227P	BNC terminators, with covers, one pair (one set required per link)

	"Backbone" LAN Components
30241A	MAU (for "backbone" LAN)
30242A	LAN coaxial cable tap
92229B	Crimp tool for N- and D-connectors
92253A	23.4m FEP LAN cable, unconnectored
92253B	23.4m FEP LAN cable, N-connectored
92253C	117m FEP LAN cable, unconnectored
92253D	500m FEP LAN cable, unconnectored
92253E	23.4m PVC LAN cable, unconnectored
92253F	23.4m PVC LAN cable, N-connectored
92253G	117m PVC LAN cable, unconnectored
92253H	500m PVC LAN cable, unconnectored
92254A	6m FEP AUI cable
92254B	12m FEP AUI cable
92254C	24m FEP AUI cable
92254D	48m FEP AUI cable
92254E	6m PVC AUI cable
92254F	12m PVC AUI cable
92254G	24m PVC AUI cable
92254H	48m PVC AUI cable
92255A	FEP AUI cable (specify length)
92255B	PVC AUI cable (specify length)
92255C	AUI cable connector kit
92255D	AUI wallplate kit
92256A	LAN coaxial cable (N-connector) kit {requires 92229B tool}
92256B	LAN AUI cable assembly tool kit {req. 92229B if using wallplate}
92256C	LAN MAU and tap tool kit
92256E	LAN surge protector and wall mounting plate
92257B	LAN loopback hood

98644A RS-232C Serial Interface

The 98644A is an EIA RS-232C (CCITT V.28/V.24) interface for the Series 200/300 computers. It is user-installable. Much of the information in this section also applies to the built-in RS-232C interface of Series 300 computers. If you have not chosen an RS-232C interface, also refer to the 98626A, 98628A and 98642A sections. The 98644A is the most economical RS-232C interface for the Series 200/300. The 98642A is more economical on a per-port basis.

The 98644A, 98626A and Series 200/300 built-in RS-232C interfaces have a one-byte buffer. They also do not provide an on-board software or hardware handshake for inbound data. Data loss can occur on input in a busy system if the aggregate baud rate for all single-byte-buffered interfaces is above 2400 bps and the character rate is above 240 cps (e.g. above human typing speed). If your application requires bursts of input data at high speeds, consider the buffered 98628A or 98642A interfaces.

On the other hand, the lack of a multi-character buffer makes the 98644A, 98626A and built-in interfaces better suited to applications where timed waits (in your program) must occur between output characters; for example, allowing carriage return time on older teleprinters.

98644A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98644A	RS-232C interface	Rev. A	Yes	Yes	4.0	5.0	3.1

The revision A boot ROM supports the 98644A as an alpha device (console display and keyboard) if the REMOTE switch is set. The boot ROM sets the card to 9600 baud, 8 bits/character, no parity, one stop bit and Xon/Xoff handshaking. The operating system being loaded commonly resets these values.

98644A Specification Summary

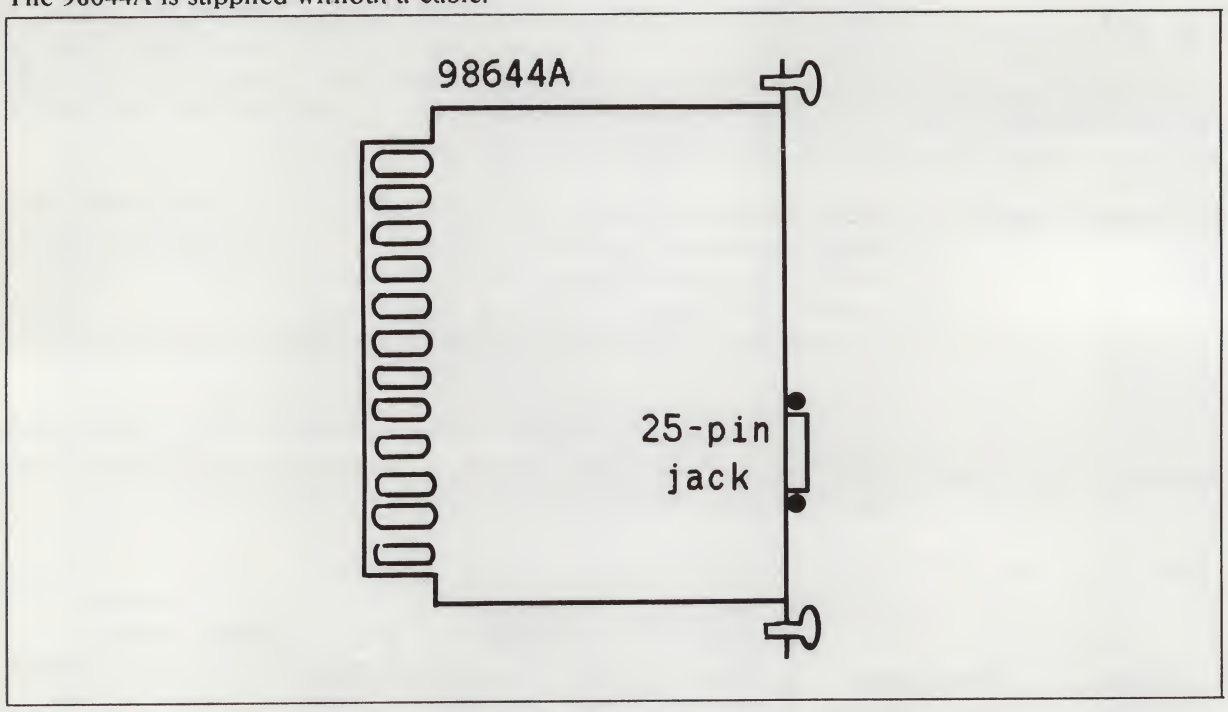
Data sheet (for complete specs.)	5954-6312
Electrical interface	EIA RS-232C, CCITT V.24/V.28
Data rates (bps)	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 19200
Input/output buffer size	1/1 byte
Character size	5 to 8 bits
Parity	Odd, Even, None, Zeroes, Ones
Stop bits	1, 1.5 (5 bits/char) or 2 (6...8 bits/char)
Hardware handshake	DSR, CD, CTS, RI
Software handshake	None
Interrupt level	3

98644A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98644A	RS-232C interface	1	Yes	9: 8 to 31	Yes	No

98644A/Series 300 Interfacing

The 98644A is supplied without a cable.



98644A Switches	Sample Configuration	Comments
Select code	11	Built-in RS-232C is at 9
Remote jumper	Present	If ITE present and is console
	Removed	If terminal on this interface is console
Modem status lines	Disconnect	Terminal, bar code reader
	Connect	Modem, printer, *uucp*

All other card parameters must be set under software control. The modem status lines switch affects all four lines simultaneously.

98644A Host Connections Provided

Interface Connector	Connector	Cable	Connector	Connector	Cable or Device	Connector	Provides Host Connection Type
25F	-	-	-	-	-	-	DIR25(F)
25F	25M	13242G (5m) or 92219R (15m)	25M	-	-	-	DIR25(M)
25F	25M	13242N (5m) 92218A (15m) 92222M (.2m)	25M	-	-	-	DTE(M)
25F	25M	13242N	25M	25F	13232U	25F	DCE(F)
25F	25M	13242N	25M	25F	Modem~Modem	25F	DCE(F)

"DIR25(M)" and "DIR25(F)" are not EIA standard notation. These designations indicate that pins 2 and 3 are reversed (compared to normal DTE(M) and DCE(F) wiring) and that these connection types should only be used where a direct-connect 3-wire circuit (transmit, receive and ground) is acceptable. All other RS-232C lines, especially the modem control lines, may not be usefully connected (if connected at all) from the peripheral to the interface when "DIR" cabling is used.

98644A Peripheral Connections Available

Host Type Required	Con.	Peripheral Cable	Con.	Con.	Peripheral
DIR25(M)	25F	40242C(5m)	25M	25F	2392A terminal
DIR25(F)	25M	40242G(5m)	25M	25F	2392A terminal
DCE(F)	25M	40242M(5m)	25M	25F	2392A terminal
DIR(M)	-	-	-	25F	2601A daisywheel printer
DCE(F)	25M	13242N (5m) or 92218A (15m)	25M	25F	2601A daisywheel printer
DIR25(F)	25M	13222Y (5m) or 92217D (15m)	50M	50F	2622A terminal
DCE(F)	25M	13222N (5m) or 92217A (15m)	50M	50F	2622A terminal
DIR25(F)	25M	13222Y (5m) or 92217D (15m)	50M	50F	2624B terminal (port 1)
DCE(F)	25M	13222N (5m) or 92217A (15m)	50M	50F	2624B terminal (port 1)
DIR25(F)	-	-	-	25F	2624B terminal (port 2)
DCE(F)	25M	13242N (5m) or 92218A (15m)	25M	25F	2624B terminal (port 2)
DTE(M)	25F	17255D (5m)	25M	25F	2686A *LaserJet* printer
DIR25(M)	-	-	-	25F	2686A (HP-UX only)
DTE(M)		<none required>		25F	37212A Modem
DCE(F)	25M	8120-3258	25M	25F	39800/01A Bar Code Reader
DCE(F)	25M	92221M (1.5m)	9M	9F	45710A, 45711A *Portable* PCs
DTE(M)		<none required>		25F	92205A/C Modem
DCE(F)	25M	82974A (1.5m)	25F	25M	82819A in 9807A *Integral* PC
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	9816A/S built-in RS-232C or 9817A/H/L* built-in
DTE(M)	25F	5061-4216 (4.9m)	50M	50F	9816A/S built-in RS-232C or 9817A/H/L* built-in
DCE(F)	25M	5061-4215 (4.9m)	50M	50F	98626A* or 98628A* interfaces
DTE(M)	25F	5061-4216 (4.9m)	50M	50F	98626A* or 98628A* interfaces
DIR25(M)	-	-	-	25F	98644A or 98561-66511/12/13 Model 310 built-in
DCE(F)	25M	13242N (5m) or 92218A (15m)	25M	25F	98644A or 98561-66530 Model 320 built-in

98644A/Series 300 BASIC Interfacing

Typical device specifier	11
Binaries required	SERIAL
Binaries optional	IO
Programming required	Yes - refer to peripheral

* This cabling is suitable for use of the remote computer as a terminal only. For use in *uucp* communications (or both), see the *uucp* discussion under 98642A.

98644A/Series 300 BASIC Considerations:

- CONTROL register programming is nearly always required to set the 98644A to some useful configuration (baud rate, parity, etc.). If this is not acceptable, consider using the 98626A or 98628A interfaces.
- The TRANSFER statement does not honor the hardware handshake switches. If you must use TRANSFER, you will need to prevent data overruns on output to slow peripherals by either reducing the baud rate or by inserting device-dependent null characters in the data.

98644A/Series 300 HP-UX Interfacing

Drivers required	`tty`
Block-mode major number	NA
Character-mode major number	1

98644A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-4	3	2	1	0
	Select	Not	Access Type			
Fields	Code	Used	NA	Line	Modem	Direction
Values (hex)	07 to 1F	000	0	0=modem 1=direct	0=U.S. 1=CCITT	0=dial in 1=dial out

Typical *mknod* for 2392A at select code 11

```
# mknod /dev/tty02  c 1 0x0b0004
```

98644A/Series 300 HP-UX Considerations:

- In a system with a 98625A disc interface, loss of input data on unbuffered RS-232C is possible at baud rates above 300 bps and character rates above 30 cps.
- The 98646A, 98644A and built-in RS-232C interfaces are not recommended for use with graphics terminals under DGL or *Starbase* graphics at data rates above 300 baud. These libraries read bursts of information from the terminal during graphics input operations and prior to starting output operations. The pre-output readback may be inhibited by selecting "output spooling" in your graphics program.

98644A/Series 300 Pascal Interfacing

Default volume	None
Modules required	RS232
Modules optional	PRINTER
Programming required	Yes - refer to peripheral

98644A Ordering Information

98644A	RS-232C asynchronous serial interface
13242G	5m "printer" cable (male-to-male, reverses pins 2&3, but is generally suitable only for direct-connect peripheral use in HP-UX)
13242N	5m male DTE cable
13232U	1.5m "modem eliminator" cable (female-to-female, reverses pins 2&3, but is generally suitable only for direct-connect peripheral use in HP-UX)
5957-9918	Terminal cabling manual
7121-1957	Select code labels (one set included w/98644A)
92178A	Male 25-pin RS-232C connector kit (2 connectors)
92178B	Female 25-pin RS-232C connector kit (2 connectors)
92178C	Male & Female 25-pin RS-232C connector kit (one each)
92218A	15m male DTE cable
92222M	0.2m male DTE cable
92234X	*The RS-232 Solution* - Campbell
98644-67950	25-pin test hood
98644-90002	Installation manual (one included w/98644A)

9866A/B Thermal Printer

The 9866A and 9866B are 200 lpm thermal dot-matrix printers for 8½-in. wide roll paper. They are no longer supplied. The 9866A is has the uppercase 9825A character set only. The 9866B added lowercase and limited graphics.

9866/Series 300 Support Summary

The 9866 printers require a GPIO interface. The 98622A Option 004 provides a 9866-compatible cable. The 9866 is not planned for testing/qualification on the Series 300 computers.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9866A	200 lpm thermal printer	NOP	Unsup.	Unsup.	Unsup.	No	Unsup.
9866B	200 lpm thermal printer	NOP	Unsup.	Unsup.	Unsup.	No	Unsup.

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
9866B	200 lpm thermal printer	No	No	No	No

98691A Programmable Datacomm Interface and 98690A PDI Development Kit

The 98691A is a user-programmable Z80-based buffered serial interface for the Series 200/300 computers. It is essentially an unloaded version of the 98628A Datacomm interface. The 98691A is useable only after user-written Z80 microcode is created and installed. The 98691A is user-installed.

The companion 98690A PDI development kit includes a firmware development guide, sample Z80 code, HP-DIO service extender board and loopback connectors. No Series 200/300 self-hosted Z80 development tools are provided. The use of a microprocessor development station, such as the HP 64000, is strongly recommended.

98691A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98691A	Datacomm interface	Rev. A	Yes	Yes	4.0	Unsup.	3.1

The revision A boot ROM identifies the 98691A but does not support it as a system console (no message output or keyboard input).

Only BASIC and Pascal have the low-level I/O intrinsics necessary for support of a user-designed interface. The 98691A might work in HP-UX if the card is programmed to emulate the 98628A from the computer's perspective. Simple data I/O (no interrupts, no DMA) may also be possible in HP-UX using the *iomap* driver described in the 98630A section.

Hardware regulatory support is limited to safety and RFI/EMI of the unloaded interface and HP-supplied cable. Regulatory qualification of the complete system (including peripheral) is the user's responsibility.

There is no HP-provided datacomm regulatory qualification for connecting the 98691A to any public network. The firmware developer must obtain the appropriate PTT certification and licenses in each country where the 98691A is to be used.

No hardware support services are offered on the 98691A card, since no diagnostic tools exist for it (and its customer-written firmware) other than a power-up self-test EPROM shipped on the card.

98691A Specification Summary

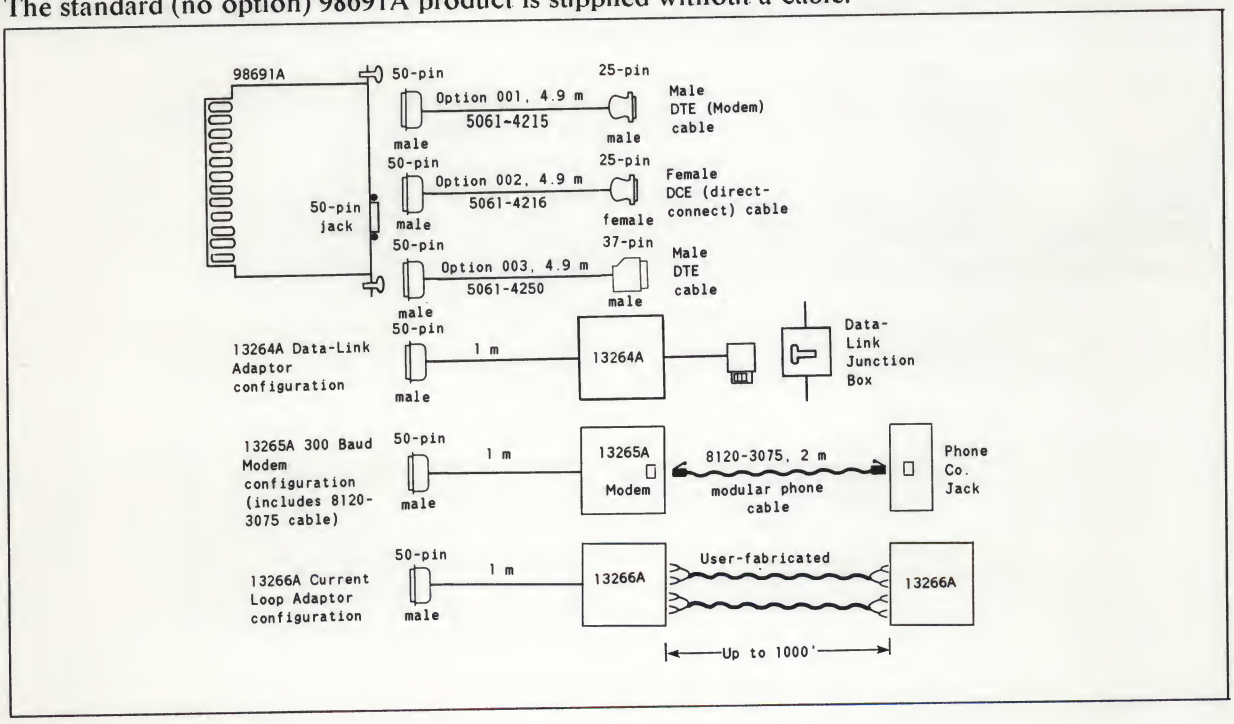
Data sheet (for complete specs.)	5954-6312
Processor	Z80A (3.7 MHz), plus Z80A CTC
USART	Z80A SIO/2
RAM	4 Kbytes standard 16 Kbytes max.
PROM socket (one) for	2712, 2732, 2764 or similar ROM up to 32 Kbytes max.
Electrical interface	EIA RS-232C, CCITT V.24/V.28 EIA RS-422, CCITT V.10 EIA RS-423, CCITT V.11 (with user fabricated cable) EIA RS-449
Data rates (bps)	50 baud to 57.6 Kbaud, async. 50 baud to 460.8 Kbaud, internal sync. 736 Kbaud max. w/external sync
Input/output lines	eight/four
Switches	Same as 98628A
Interrupt level	3...6 (default 3)

98691A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98691A	PDI interface	1	Yes	20: 8 to 31	Yes	No

98691A/Series 300 Interfacing

The standard (no option) 98691A product is supplied without a cable.



98691A/Series 300 BASIC Interfacing

Typical device specifier	20
Binaries required	DCOMM
Binaries optional	IO
Programming required	Depends on user-firmware

98691A/Series 300 Pascal Interfacing

Default volume	None
Modules required	DATA_COMM
Modules optional	Depends on user-firmware
Programming required	Depends on user-firmware

98691A Ordering Information

98690A	DPI development kit
Option 630	Software examples on 3½-in. flexible disc (single sided)
Option 650	Software examples on 5¼-in. flexible disc (ext. interleave)
Option 655	Software examples on 5¼-in. flexible disc (int. interleave)
98691A	Programmable datacomm interface
Option 001	Adds 5061-4215 4.6m RS-232C DTE (male) cable
Option 002	Adds 5061-4216 4.6m RS-232C DCE (female) cable
Option 003	Adds 5061-4250 4.6m RS-423/449 DTE (male) cable
09826-66544	HP-DIO service extender card (one included w/98690A)
13265A	50-pin to Bell 103 modem
13266A	50-pin to current-loop adaptor
5061-4215	4.6m male RS-232C DTE cable
5061-4216	4.6m female RS-232C DCE cable
5061-4250	4.6m RS-423/449 DTE (male) cable
5957-9918	Terminal cabling manual
7121-1957	Select code labels (one set included w/98691A)
92178A	Male 25-pin RS-232C connector kit (2 connectors)
92178B	Female 25-pin RS-232C connector kit (2 connectors)
92178C	Male & Female 25-pin RS-232C connector kit (one each)
98628-90001	Installation manual (one included w/98691A and 98690A)
98690-90001	Firmware development guide (one included w/98690A)

98693A HP-UX SRM Access Utilities

The 98693A SRM access utilities provide an interface driver and user commands that allow a Series 200 or 300 HP-UX system to transfer files (NFT) between the local HP-UX file system and one or more remote HP Shared Resource Management systems.

The 98693A package supports, but does not include, the 50961A Option 200 SRM/Coax interface and/or the 98629A SRM Mux interface. Order the SRM interface and cabling separately.

The 98693A package provides the following commands:

srmclean	Reset SRM link hardware and software
srmcp	Copy file to/from SRM
srmlink	Create SRM directory entry linked to existing SRM file
srmls	List SRM directory
srmmkdir	Create directory on SRM
srmmv	Move (relocate) or rename SRM file or directory
srmprotect	Add/delete/change password on SRM file
srmrm	Purge SRM file or directory

98693A does not provide programmatic remote file access (RFA).

98693A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98693A	HP-UX SRM access utilities	NA	Yes	Yes	NA	5.0	NA

HP-UX cannot boot from SRM.

98693A Specification Summary

Data sheet (for complete specifications)	5953-9520
HP-UX environment required	AXE
RAM required (above 1.0 Mbyte min. sys.)	None
Disc space used (as supplied)	320 Kbytes
Required SRM interface:	50961A Option 200 or 98629A and 98028A Mux
Maximum SRM interfaces	Limited by select codes
Supported peripherals:	Any supported by HP-UX 5.0

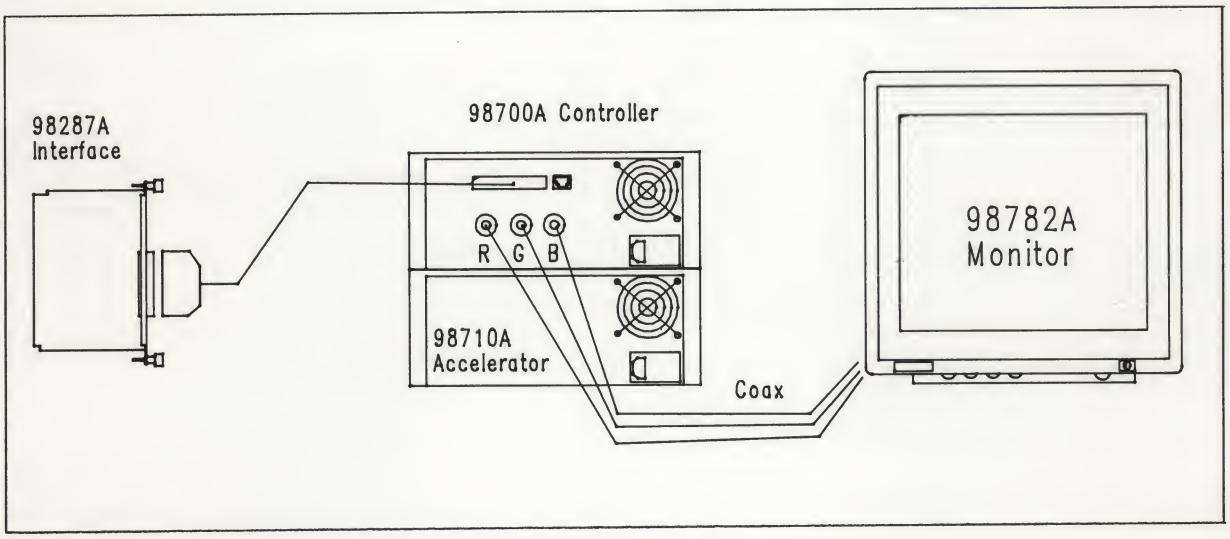
98693A/Series 300 HP-UX Interfacing

98693A is copied from the distribution media to the your system with the HP-UX *update* command. The SRM driver is installed with the HP-UX *config* command. Refer to the 50961A section for programming information.

98693A Ordering Information

98693A	HP-UX SRM access utilities
Option 022	Software on ½-in. cartridge tape
Option 045	Software on 3½-in. flexible disc (double-sided format)
98693R	Right-to-copy 98693A for additional system
98693A+S00	SMS for 98693A (requires 99084F+C00)
98693A+W00	Extended SMS for 98693A (right to copy 98693A+S00 updates)
99084F+C00	Utilities category support service (required if operating system has AMS or RCS support)
99084F+Q00	MUS for all utilities
99084F+V00	Extended utility category support service (requires 99084F+C00)

98700H Graphics Display Station



The 98700H is a high resolution graphics display station that is connected locally or remotely (up to 30m) to a Series 300 (Option 030) or Series 500 (Option 050) computer. HP-UX provides the 98700H with full terminal emulation.

A complete 98700H station consists of:

- An interface or adaptor for the host computer:

  Series 300 - Option 030 provides a 98287A Display Station Interface (DSI) card and 2m cable to the 98700A display station controller. The DSI is a standard HP-DIO I/O card.

  Series 500 - Option 050 provides a 98288A Display Station Buffer (DSB) and a 2m cable to the 98700A display station controller. Note that the DSB is an MPB board and *not* an I/O card.

- One 98700A display controller. This is a five unit high, 325mm-wide *Design-Plus* modular enclosure. If it is ordered with (or later upgraded to include) an Option 710 (HP98710A) graphics accelerator, the controller becomes ten units high. The accelerator is a distinct unit which connects to the controller via a dedicated 200-pin socket on the bottom of the controller.
- One 98782A 19-in. color monitor. The 98700H package includes one HP98290A 3.0m RGB cable to connect the monitor to the Controller. You may increase this distance to 15 or 30m with a 46082A/B HP-HIL/RGB extension. A 98783A tilt/swivel unit is available for use on tables other than the 97064A.
- One 2.4m 46081A Extension for HP-HIL and audio and one 46020A HP-HIL keyboard. The supplied HP-HIL coiled cable from the extension to the keyboard is 0.8-to-3.0m. You may substitute a 15 or 30m extension by specifying option 082 (46082A) or Option 083 (46082B).

This section discusses primarily the 98287A interface, 98700A controller, 98710A accelerator and system cabling. The following components are described separately: 46020A keyboard, 46081A extension and 98782A monitor. The 98700H Option 030 is user-installable. The 98700H Option 050 includes installation by an HP Customer Engineer.

98700H/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98700H	Graphics display station	Rev. A	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
98700H	Graphics display station	4.0	via *Starbase*	5.0	3.1
98701A	Total of 8 memory planes	4.0	via *Starbase*	5.0	3.1
98710A	Graphics accelerator	Unsup.	via *Starbase*	5.0	Unsup.

BASIC and Pascal graphics do not use the 98710A graphics accelerator.

Series 300 operating systems presently do not support the HP-HIL interface of the 98700 controller. HP-HIL devices must be connected to the Series 300 mainframe. This effectively limits these systems to a single 98700 *workstation*. One additional 98700H can be used as a graphics display.

98700H Specification Summary

Data sheet (for complete specs.)	5953-9572, 5953-9543
Dimensions (98700A)	132mmH, 325mmW, 292mmD
(Option 710 adds)	132mmH
Weight (98700A)	6.8 kg (8.1 kg shipping)
(Option 710 adds)	6.8 kg (8.1 kg shipping)
Video output:	
Refresh rate	60 Hz non-interlaced
Colors available	16 of 16 777 216 (standard)
	256 of 16 777 216 (Option 701)
Frame buffer size	1024 Vertical × 1024 Horizontal
Displayed buffer size	768 Vertical × 1024 Horizontal
Effective graphics resolution	1024 × 768
Default alpha resolution	48 lines × 128 columns
Default alpha character cell	6 × 10 in 8 × 16 pixels
Default character sets	ROMAN8, KANA8
CPU pixel write speed	60 pixels/sec. (Model 310), 120 pixels/sec. (320)
Hardware pixel write	1.0 M pixels/sec. horizontal
	0.28 M pixels/sec. vertical
	2.5M pixels/sec (with Option 710)
Window move speed	16 M pixels/sec.
Scrolling speed	24 M pixels/sec.
Area fill speed	12 M pixels/sec.
Vector generation (25 pixel lines)	7 000/sec. (std.) 62 000/sec. (Opt. 710)
AC voltage ranges	90 to 125 and 198 to 250
AC frequency tolerance	49 to 66 Hz
AC power required	350 Watts, max. (complete 98700H)

The 98700H has 1024×256 pixels of off-screen buffer (4 or 8 bits per pixel).

98287A (98700H) HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
98287A	Display Station Interface	1	Yes	-	No	No
	HP-HIL	-	-	31: 8 to 31	No	No
	External control space	-	-	25: 8 to 31	No	No
	Internal control space	-	-	0x560000	No	No

The control space of the 98287A may be set to "internal" 0x560000 (hexadecimal) or to an "external" (select code-based) control space. The frame buffer address may be set to 0x200000, 0x300000, 0x800000 or 0x900000. The considerations for setting these parameters are covered in the following paragraphs.

98700H/Series 300 Interfacing

The 98287A DSI card connects to the 98700 controller via a 2m cable terminated with pin & socket connectors. The 98700 controller connects to the 98782A monitor via a 3m molded BNC-to-BNC cable assembly. All HP-HIL devices must connect to the mainframe HP-HIL interface.

Graphics Interface	Interface Cable	Graphics Controller	Con-nector	Con-nector	Video Cable	Con-nector	Con-nector	Monitor
98287A	98700-61601	98700H	BNC-F	BNC-M	98290A	BNC-M	BNC-F	98782A
		98710A						

The following considerations apply to configuring the 98287A interface:

- HP-HIL devices connected to the 98700H are not supported by Series 300 operating systems at this time. Set the HP-HIL select code to any unused value (31 is suggested). If you have two 98700H's, you may set both (unused) HP-HIL select codes to the same value.
- If the 98700H is the sole system display, you must set the 98287A to "internal" control space for it to be recognized as console by HP-UX or Pascal.
- If a 98542/43/44/45A or (enabled) Model 310 built-in video board is present, the 98287A *must* be set to an "external" control space (select code 25 is suggested) and the frame buffer *must* be set to a value other than 0x200000 (switch position "00"); 0x300000 is suggested (switch position "01"). (The 98540-series boards are fixed at control space 0x560000 and frame buffer address 0x200000.)
- If a 98546A compatibility video card set is present, and you want the 98700H to be the console, set the 98287A to "internal". The 98287A must be set to "internal" to select it as console under BASIC software control.
- If a 98546A compatibility video card set is present, and you want the 98546A to be the console, set the 98287A to "external".
- If you have more than one 98700H, the second 98287A must be set to "external" (and a different control space select code if both 98287As are external) and they both must have different frame buffer addresses. They may have identical HP-HIL select codes as long as the HP-HIL port is not used. Note that frame buffer addresses 0x800000 and 0x900000 are usable *only* in the Model 310. This means a Model 320 may have only two bit-mapped displays (one 98540-series and one 98700H, or two 98700Hs).

98287A Switches	Sample Configuration	Comments
HP-HIL select code	31	Not currently used for I/O, but must not conflict with another I/O card.
Control space select code	Internal External(25)	If sole display, or If 98540-series present
Frame buffer address	0x300000	For first 98287A

The 98700H is compatible with the 46082A/B 15/30m HP-HIL/RGB extensions. The 15/30m RGB cables in the 46082 replace the 3m cable supplied with the 98700H.

98700H/Series 300 BASIC Interfacing

BASIC uses the 98700H as the default alpha/graphics display according to to the search priority in the **Alphanumeric Displays and Terminals** section of **Chapter 4**.

Typical device specifier	`CRT` (or 1 if for alpha or graphics if currently the console) 6 (for graphics, "internal") 25 (for graphics, "external")
Binaries required	CRTB (alpha), GRAPH (graphics)
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 25,"INTERNAL"` (if set to "external")

98700H/Series 300 HP-UX Interfacing

Drivers required	`console, graphics`
Block-mode major number	NA
Character-mode major number	0 (alpha), 12 (graphics)
Terminfo entry	`98700, hp98700`
DGL handler (via *Starbase*)	`D0056`
Starbase handler	`/usr/lib/libdd98700.a`

98700H/Series 300 HP-UX Driver Minor Number ('graphics' driver only)

Bits	23-16	15-12	11-8	7-0
Fields	Select Code	Not Used	Position	Not Used
"Internal" (hex)	00	0	0 (98546A not present) 1 (98546A present)	00
"Internal" (hex)	08 to 1E	0	2	00

Typical *mknod*s for "internal" 98700H with no 98546A present.

```
# mknod /dev/console   c  0 0x000000
# mknod /dev/graphics  c 12 0x000000
```

98700H/Series 300 Pascal Interfacing

Default volume	`CONSOLE:` (or 1)
Modules required	CRTC
Modules optional	GRAPHICS (any Series 300) FGRAPHICS (Model 310 with 98635A) FGRAPH20 (Model 320)

98700H Ordering Information

98700H	Graphics display station
98700HC	French Canadian version
98700HD	German version
98700HE	European Spanish version
98700HF	Continental French version
98700HH	Dutch version
98700HJ	Katakana/JASCII version
98700HK	Universal English version
98700HL	Canadian English version
98700HM	Latin Spanish version
98700HN	Norwegian version
98700HP	Swiss-German version
98700HQ	Swiss-French version
98700HS	Swedish version
98700HU	United Kingdom version
98700HW	Flemish/Belgian-French version
98700HX	Finnish version
98700HY	Danish version
98700HZ	Italian version
Option 001	Substitute U.S. ASCII keyboard (46020A) for native language keyboard. Do not specify on products 98700H and 98700HK. Power cable and documentation is unchanged
Option 030	For use with Series 300; provides 98287A DSI
Option 050	For use with Series 500; provides 98288A DSB
Note	Order only one of Option 082 or 083
Option 082	Substitute 46082A 15m HP-HIL/RGB remote extension for 3m RGB cable
Option 083	Substitute 46082B 30m HP-HIL/RGB remote extension for 3m RGB cable
Option 701	Adds four memory planes (brings total to eight)
Option 710	Adds 98710A graphics accelerator
98569A	19-in. EIA rackmount adaptor for 98700A and/or 98710A
46082A	15m HP-HIL/RGB extension
46082B	30m HP-HIL/RGB extension
5958-4342	Installation note (one included w/98700H)
7121-1957	Select code labels (one set included w/98287A)
97064A	CAD worktable
35B903-HAI	Adaptor for 98782A monitor on older 97064A tables
98290A	3m RGB cable
98700-61603	2.4m RGB video cable (one included w/98700H)
98701A	Four additional memory planes for existing 4-plane 98700H (max of 8 total)
98710A	Graphics Accelerator for existing 98700H
98783A	Tilt/Swivel unit for 98782A 19-in. monitor (not required with 97064A CAD table)

9871A Daisywheel Printer

The 9871A is a 30 cps daisywheel impact printer. It is no longer supplied. The standard printer has an 8-bit parallel interface. The 9871A Option 001 has an HP-IB interface.

9871/Series 300 Support Summary

The 9871 is not planned for testing/qualification on the Series 300 computers. There is no GPIO cable available for the standard 9871A. The HP-IB version (Option 001) may work with current systems but has not been tested.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9871A#001	30 cps printer, HP-IB	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.

9872A/B/C/S/T Plotter

The 9872 is an ANSI/ISO B/A3-size flatbed HP-IB HP-GL plotter. It is no longer supplied, and was available in the following versions:

9872A - 4 pen, manual paper loading. The 9872A was replaced by the 9872B.

9872B - 4 pen, manual paper loading. The 9872B has 5 additional HP-GL commands not found on the 9872A: OA, OF, OI, OO and SC. Current graphics software may rely on one or more of these instructions. The 9872B was replaced by the 9872C.

9872C - 8 pen version of 9872B. The current replacement for the 9872C is either the 7475A (6-pen, manual feed) or the 7550A (8 pen, auto sheet feed).

9872S - roll-feed version of the 9872B. The 9872S was replaced by the 9872T.

9872T - roll-feed version of the 9872C. The current replacement for the 9872T is the 7550A (8 pen, auto sheet feed).

9872/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9872A	B/A3 4-pen plotter	NOP	Unsup.	Unsup.	Unsup.	Unsup.	Unsup.
9872B	B/A3 4-pen plotter	NOP	Planned	Planned	Unsup.	5.0	3.1
9872S	B/A3 4-pen roll-feed plotter	NOP	Planned	Planned	Unsup.	5.0	3.1
9872C	B/A3 8-pen plotter	NOP	Planned	Planned	4.0	5.0	3.1
9872T	B/A3 8-pen roll-feed plotter	NOP	Planned	Planned	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
9872A	B/A3 4-pen plotter	Unsup.	Unsup.	Unsup.	Unsup.
9872B	B/A3 4-pen plotter	Unsup.	5.0	5.0	3.1
9872S	B/A3 4-pen roll-feed plotter	Unsup.	5.0	5.0	3.1
9872C	B/A3 8-pen plotter	4.0	5.0	5.0	3.1
9872T	B/A3 8-pen roll-feed plotter	4.0	5.0	5.0	3.1

Because the 9872A does not have the "OI" instruction, graphics software cannot determine that the plotter is actually present.

Use of the 9872A in HP-UX may require operation of the graphics software in "spooled" mode. This requires setting a bit in DGL and *Starbase* graphics. The 9872A may produce unexpected results. Input from the 9872A is probably not possible.

9872C HP-IB Characteristics

SH1, AH1, T2, TE0, LE0, SR1, RL0, DC1, DT0, L2, PP0 (PP2 at addresses 0...7 or listen-only).

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9872	B/A3 plotter	1	0...30	1	N or H	0.0m	None

9872/Series 300 Interfacing

Only the built-in HP-IB or 98624A support plotters such as the 9872. Refer to 98624A for HP-IB cabling information.

9872C/T Switches	Sample Configuration
HP-IB address	5
Listen Only	Off
Confidence Test	Off

9872/Series 300 BASIC Interfacing

Typical device specifier	705
Binaries required	HPIB, GRAPH
Binaries optional	GRAPHX
Programming required	`PLOTTER IS 705,"HPGL"`

9872/Series 300 HP-UX Interfacing

Drivers required	`hpib`
Block-mode major number	NA
Character-mode major number	21
DGL handlers	`L0002, P0002` (all) `D0015` (9872C/T) `D0016` (9872T)
Starbase handler	`/usr/lib/libddhpgl.a`

Both the DGL and *Starbase* handlers reject the 9872A in non-spooled mode.

9872/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-0
Fields	Select Code	HP-IB Address	Not Used
Values (hex)	07 to 1F	00 to 1E	00

Typical *mknod*s for 9872 at select code 7, bus address 5

```
# mknod /dev/plt  c 7 0x070500
```

9872/Series 300 HP-UX Considerations:

- The 9872 has no pacing protocol. When it is busy (plotting), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 9872. If you have a built-in and a 98624A interface, use the 98624A for the 9872. If possible, a dedicated 98624A is suggested.

9872/Series 300 Pascal Interfacing

Default volume	None
Modules required	HPIB, plus GRAPHICS or FGRAPHICS (w/98635A) or FGRAPH20 (Model 320)
Modules optional	None

9874A Digitizer

The 9874A is a B/A3-size HP-IB HP-GL graphics digitizer. It is no longer supplied. Specify the 46088A HP-HIL B/A3-size digitizer for new applications.

9874A/Series 300 Support Summary

The 9874A has not been tested with any Series 300 system. The 9874A's HP-GL commands are not identical to the supported 9111A tablet. HP-UX DGL and *Starbase* have no handlers for the 9874A, and the 9111A (or any other handler) will not work with the 9874A (and "spooling" is not allowed on input). Whether BASIC or Pascal graphics can communicate with the 9874A is not known.

9876A Thermal Line Printer

A 480 lpm dot-matrix HP-IB printer for 8½-in. wide fan-fold paper. The 9876A is a good choice where a rugged, compact, high-speed, low-noise printer is required. Where size is not a criterion, the 2686A *LaserJet* operates at roughly the same speed and provides higher print quality at lower cost. The 9876A will not be supplied after August 31, 1986.

9876A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9876A	480 lpm thermal printer	NOP	Yes	Yes	4.0	5.0	3.1

Product	Description	Graphics Software Support			
		BASIC Graphics	HP-UX DGL	HP-UX *Starbase*	Pascal DGL
9876A	480 lpm thermal printer	Raster Dump	No	Raster Dump	Raster Dump

9876A Specification Summary

Data sheet (for complete specifications)	5953-4527
Dimensions	147mmH, 351mmW, 446mmD
Weight	13.6 kg (24 kg shipping)
Interface and command set	HP-IB, similar to PCL-1
Paper width (min., max.)	8½-in., 210mm, fan-fold
Print speed	480 lpm 3.8mm/sec graphics
Paper capacity	300 pages
Character cell	5×7 in 7×12
Print pitches (cpi)	11
Length lengths (respectively)	80 characters
Line spacing (lpi)	variable, default 6
Character sets	Roman Extension, Katakana, 6 ISO-7
Graphics density (dpi)	77×77
AC voltage required	100, 120, 220, 240 ±10%
AC frequency tolerance	48 to 63 Hz
AC power required	155 VA max.

9876A HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9876A	480 lpm printer	1	0...30	1	N or H	0.0m	None

9876A/Series 300 Interfacing

Only the built-in HP-IB or 98624A support simple printers such as the 9876A.

9876A Switches	Sample Configuration
HP-IB address	1
SRQ	Off
7-bit/8-bit	8-bit
LA (Listen Always)	Off

The 9876A is also offered with an RS-232C interface and an 8-bit parallel interface. The RS-232C version has not been tested with any Series 300 computer. There is no Series 300 cable for the parallel version.

9876A/Series 300 BASIC Interfacing

Typical device specifier	701
Binaries required	HPIB
Binaries optional	IO
Programming required	PRINTER IS 701
DUMP GRAPHICS supported	Yes

9876A/Series 300 HP-UX Interfacing

Drivers required	printer
Block-mode major number	NA
Character-mode major number	7
Spooler model file	dumb or modify 2225a
DGL/*Starbase* handler	None

9876A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3	2	1	0
Fields	Select Code	HP-IB Address	Not Used	Auto FF	Case Fold	Over-print	Cooked vs Raw
Values (hex)	07 to 1F	00 to 1E	0	1=NO-EJECT	1=Upper	1="NOCR"	1=RAW

Typical *mknod*s for 9876A at select code 7, bus address 1

```
# mknod /dev/lp  c 7 0x070100
# mknod /dev/rlp c 7 0x070101
```

9876A/Series 300 HP-UX Considerations:

- The 9876A has no pacing protocol. When it is busy (printing), it merely freeezes the bus handshake until buffer space is available. This denies use of the bus to other devices on the bus. If you have a built-in and 98625A interface, use the built-in interface for the 9876A. If you have a built-in and a 98624A interface, use the 98624A for the 9876A. If possible, a dedicated 98624A is suggested.
- The 9876A can print graphics raster data supplied by the *dump_graphics.c* command.

9876A/Series 300 Pascal Interfacing

Default volume	PRINTER: or #6
Modules required	PRINTER
Modules optional	HPIB
Graphics dump supported	Yes

9876A Ordering Information

9876A	Thermal graphics printer
09876-90000	Peripheral Manual (one included w/9876)
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
92220R	0.3m right-angle HP-IB cable
9270-0640	Black printing 8½ ×11-in. paper (box of 4 packs)
9270-0641	Blue printing 8½ ×11-in. paper (box of 4 packs)
9270-0642	Black printing 211mm×297mm paper (box of 4 packs)
9270-0643	Blue printing 211mm×297mm paper (box of 4 packs)

98781A 17-in. Video Monitor

The 98781A is a monochromatic (white) monitor for high resolution text and graphics applications. It has a built-in speaker, twivel base, and passive HP-HIL jack. The 98781A is compatible with the following video interfaces:

- 98544A high resolution video board (Series 300);
- 09920-66562 raster graphics board (Model 237).

The 98582A bundled Series 300 system and the 9837H computer include a 98781A. The 98781A is user-installable.

98781A/Series 300 Support Summary

Product	Description	Hardware Support 310	320
98781A	17-in. monitor	Yes	Yes

Host computer support of the 98781 monitor depends on the video interface used. Refer to 98544A in this appendix.

98781A Specification Summary

Dimensions	422mmH, 435mmW, 370mmD
Weight	23.1 kg (27.3 kg shipping)
Active display area	304mmW × 234mmH
Phosphor	White P40
Intensity	35 FL max., adjustable
Character size (10×15 cell)	1.8mmW, 3.0mmH
Interface	Composite video, BNC video, 7-pin "sync" cable carries sync, HP-HIL and audio
AC voltage required	95 to 125, 195 to 250
AC frequency tolerance	48 to 66 Hz
AC power required	100 Watts, max.

98781A/Series 300 Interfacing

Refer to host video board: 98544A

98781A Ordering Information

98781A	17-in. Monitor
92193V	CRT cleaning kit
5958-4342	Installation Note (half-size, one included w/98544A board)
98560-90603	Installation Card (full-size, one included w/98582A system)
98781-90000	Hardware Support Document (full-size)

98782A Color Video Monitor

The 98782A is a 19-in. (diagnonal) CRT monitor featuring excellent brightness and a low-glare cylindrical face with anti-reflective coating. It is compatible with the following interfaces:

- 98545A high-resolution color video board (Series 300);
- 98700A/H graphics processor (Series 300 and 500).

The 98782A monitor does not have a speaker. It is commonly used with a 46081A or 46082A/B HP-HIL extension, both of which provide a speaker. A 98782A and 46081A are included in the 98700H display station product and the 98583A bundled Series 300 computer. The 98782A is user-installable.

98782A/Series 300 Support Summary

Product	Description	Hardware Support 310	320
98782A	19-in. color monitor	Yes	Yes

Host computer boot ROM and software support of the 98782A monitor depends on the video interface used. Refer to 98545A and 98700H in this appendix.

98782A Specification Summary

Data sheet (for complete specifications)	5953-9572, 5953-9543
Dimensions	499mmH, 496mmW, 596mmD
Weight	40.7 kg (47.5 kg shipping)
Active area	360mmW × 270mmH
Phosphor	P22
Intensity	26.3 FL (90 Cd/m^2), max., adjustable
Resolution	1024 Horizontal × 768 Vertical
Chromaticity coordinates	X: 0.64R, 0.29G, 0.15B Y: 0.33R, 0.66G, 0.06B
Character size (10×15 cell)	2.3mmW × 3.8mmH
Pitch	0.31mm
Interface	Composite RGB video, BNC, sync on green
AC voltage required	90 to 125, 198 to 250
AC frequency tolerance	48 to 66 Hz
AC power required	220 Watts, max.

98782A/Series 300 Interfacing

Refer to the 98545A and 98700H discussions for interfacing information.

98782A Ordering Information

98782A	19-in. color monitor
92193V	CRT cleaning kit
97064A	CAD worktable
35B903-HAI	Adaptor for use with older 97064A tables
98782-90001	Installation Note (one included w/98782A)
98783A	Tilt/swivel for use on tables other than 98782A

98791B HP 2392A/VT100 ™ Terminal Emulator

The 98791B terminal emulator is a stand-alone software package which makes a Series 200 or 300 computer emulate a Hewlett-Packard 2392A or Digital Equipment Corp. VT100™ alphanumeric terminal. The 98791B product includes an execute-only Pascal environment. In addition to terminal emulation, the 98791B also provides text file upload/download capability.

98791B/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98791B	HP 2392A/VT100™ emulator	Rev. A	Yes	Yes	NA	NA	3.1

A Series 200/300 computer executing the 98791B emulator is supported as a user terminal under the Series 200, 300 and 500 HP-UX operating systems. RAM-based terminal emulators (such as the 98791B) are not supported as HP-UX system consoles.

98791B Specification Summary

Data sheet (for complete specs.)	5953-9541
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	1.3 Mbytes
Required video interface	Any 98540-series, or 98700H
Required serial interface:	Series 300 built-in RS-232C, 98626A, 98628A or 98644A
Supported peripherals:	Any supported by Pascal 3.1
Additional tested peripherals:	
Modems, supported	HP 92205A/B/C, HP 37212A,
Modems, tested	U.S. Robotics *Courier2400*, Ventel 212, Bell 103J, Bell 212A, Vadic 3450
Average throughput	9600 baud
2392A features not supported	smooth scroll, linedraw characters, second softkey label line, toggle Xon/Xoff with [STOP], hard reset, self-test, frame rate, bell disable, softkey trigger (Ec &f<key>E), straps N, X and Z, host device control
VT100 features not supported	132 column mode, double-height, double-width, no-scroll key, inverse screen, keyclick, margin bell off, invoke confidence test
Configuration	From keyboard, saved in local disc file
Security	Codeword (saved in local disc file), keyed to:
Series 200	Computer mainframe ID PROM (46084A optional on Model 217, 237 and some 220s)
Series 300	46084A HP-HIL ID Module (not included)

Video display highlights are limited by the video interface and monitor used. The 98546A compatibility interface offers inverse, underline, blinking and half-bright. The 98540-series and 98700H bit-mapped displays offer only inverse and underline.

VT100 is a trademark of Digital Equipment Corp.

Auto-dial software is not supplied. The HP92205, HP37212, U.S.R. *Courier2400* and other modems have auto-dial commands which you can type in on the emulator keyboard.

98791B/Series 300 Pascal Interfacing

The 98791B terminal emulator may be linked and executed as a normal Pascal ".CODE" file in Pascal 3.1. The security codeword and 46084A ID module are still required.

98791B Ordering Information

98791B	HP2392A/VT100™ Terminal Emulator
Option 042	Software on 5¼-in. flexible disc
Option 044	Software on 3½-in. flexible disc (single-sided format)
46084A	HP-HIL ID module
98791-90001	Model 226/220/236 2392A and VT100 manual (one included w/98791B)
98791-90010	Model 226/220/236 2392A manual (one included w/98791B)
98791-99001	Model 217/237/300 2392A and VT100 manual (one included w/98791B)
98791-99010	Model 217/237/300 2392A manual (one included w/98791B)
98791B+S00	SMS for 98791B (requires 99083F+C00)
98791B+W00	Extended SMS for 98791B (right to copy 98791B+S00 updates)
99083F+C00	Datacomm-A category support service (required if Pascal system has RCS support)
99083F+Q00	MUS for all datacomm-A products
99083F+V00	Extended datacomm-A category support service (requires 99083F+C00)

98815A Graphics Presentations/200

Graphics Presentations is a set of interactive BASIC application programs for the creation of overhead transparencies. With it you can create simple text, bar, line and pie charts. It also has commands for creation of images with arbitrary lines and arcs. 98815A is not a general purpose graphics editor.

98815A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98815A	Graphics Presentations	Rev. A	Yes*	Yes*	4.0	NA	NA

98815A Specification Summary

Data sheet (for complete specifications)	5953-4699
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	786 Kbytes
Supported peripherals:	
Mass Storage	Any supported by BASIC 4.0
Printers	Any supported by BASIC 4.0
Plotters	Any supported by BASIC 4.0
Plot-to-file	Both local and SRM files
Human input	46060A Mouse, 9111A tablet

The 46087/88A HP-HIL tablets have not been tested and probably require modification of the program (supplied in source form).

98815A Ordering Information

98815A	Graphics Presentations
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 650	Software on 5¼-in. flexible disc (external interleave)
Option 655	Software on 5¼-in. flexible disc (internal interleave)
35159A	HP *HelpLine* certificates (package of five)
98815-12113	Graphics Presentation manual (one included w/98815A)

* Graphics Presentations presently requires the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color).

98817A Project Management/200

Project Management is a set of interactive BASIC application programs for project network analysis using the PERT, CPM or MPM methods. The results are reported in tabular form or as GANTT charts.

98817A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98817A	Project Management	Rev. A	Yes*	Yes*	4.0	NA	NA

98817A Specification Summary

Data sheet (for complete specifications)	5953-4699
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	786 Kbytes
Supported peripherals:	
Mass Storage	Any supported by BASIC 4.0
Printers	Any supported by BASIC 4.0
Plotters	Any supported by BASIC 4.0
Plot-to-file	Both local and SRM files
Human input	Keyboard only

98817A Ordering Information

98817A	Project Management
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 650	Software on 5¼-in. flexible disc (external interleave)
Option 655	Software on 5¼-in. flexible disc (internal interleave)
35159A	HP *HelpLine* certificates (package of five)
98815-12112	Project Management manual (one included w/98817A)

* Project Management presently requires the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color).

98819A HP TechWriter 1.2

HP TechWriter is an interactive text editor with merged graphics capability. It is a stand-alone software product which includes an execute-only Pascal 3.1 environment.

The human interface to the editor is very similar to the Pascal editor. Graphics images are created by any Series 200 or 300 application that produces "plot files", such as HP98305A HPEGS, HP98817A Project Management, and BASIC 3.0 (or later) or Pascal 3.0 (or later) user programs. Graphics is included in a document by translating the contents of the HP-GL plot file to TechWriter format (using a supplied utility).

98819A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98819A	HP TechWriter 1.2	Rev. A	Yes	Yes	NA	NA	3.1

98819A Specification Summary

Data sheet (for complete specs.)	5953-4698
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	768 Kbytes
Supported peripherals:	
Mass Storage	Any supported by Pascal 3.1
Printers	Text printing only, tested on: 2631B, 2671A
Printers	Text & graphics printing tested on: 2225A, 2631G, 2671G, 2673A, 2932A, 2933/34A, 82906A, 9876A
HP-GL commands translated	LT, PA, PD, PU
Tested plot-file applications	98305A, 98815A, 98817A, 98820A
Security	Codeword: requires 46084A ID module (not included) connected to mainframe

Without a valid codeword (or without the correct 46084A ID module), HP TechWriter operates only in "demo" mode. The 98819A/R products include a *Codeword* certificate. After delivery of the 46084A ID module, HP issues to you (via telephone) a unique "codeword" which is keyed to the serial number of your ID module.

After typing in the codeword the first time you execute HP TechWriter, it is stored in a file. The codeword unlocks the full capability of HP TechWriter on any Series 300 computer to which that specific ID module is connected. The ID module must remain connected while HP TechWriter is executing.

You may secure different software products to the same ID module; however, this reduces their portability. Each 46084A has a unique serial number. If you lose a 46084A, you must obtain a new certificate (and codeword) for the replacement 46084A. In the case of HP TechWriter, you can obtain a new certificate by ordering 98819R.

98819A/Series 300 Pascal Interfacing

HP TechWriter may be linked and executed as a normal application program in the full Pascal 3.1 system. The 46084A ID module is still required.

98819A Ordering Information

98819A	HP TechWriter (includes software, manual set and certificate)
Option 042	Software on 5¼-in. flexible disc (Series 200 internal interleave)
Option 043	Software on 5¼-in. flexible disc (external interleave)
Option 044	Software on 3½-in. flexible disc (single-sided format)
98819R	Right-to-copy 98819A (includes manual set and certificate)
	HP TechWriter upgrades
	(uses existing codeword, includes one manual set)
98819-17421	TechWriter 1.0 or 1.1 to 1.2 upgrade on Option 043 media
98819-17441	TechWriter 1.0 or 1.1 to 1.2 upgrade on Option 044 media
	HP TechWriter Support Services
98819A+S00	SMS for 98819A (may require 99083F+C00)
98819A+W00	Extended SMS for 98819R (may require 99083F+W00)
99083F+C00	Data Management Category support (required if 98615C+Hxx or +Txx in force)
99083F+W00	Extended Data Management Category support (required if 98615C+Vxx in force)
	HP TechWriter Documentation
98819-90000	HP TechWriter User's Guide (one included w/98819A/R)
98819-90001	HP TechWriter Reference (one included w/98819A/R)

98820A/B/C Statistics Library

Statistics Library is a set of interactive BASIC application programs for the entry, editing, analysis, reporting and graphical presentation of statistical data. The 98820A product is the complete set. You can also purchase the library in two separate parts: 98820B and 98820C. There is a companion product for numerical analysis, 98821A, described separately.

98820A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98820A	Statistics Library	Rev. A	Yes*	Yes*	4.0	NA	NA
98820B	Stat. Lib. part I	Rev. A	Yes*	Yes*	4.0	NA	NA
98820C	Stat. Lib. part II	Rev. A	Yes*	Yes*	4.0	NA	NA

98820A Specification Summary

Data sheet (for complete specs.)	5953-4699
RAM required (total, stand-alone)	512 Kbytes
Disc space used (as supplied)	1.3 Mbytes (each part)
Dependencies	Part II requires part I
98820A includes	98820B and 98820C
98820B includes	Basic statistics and data manipulation, regression analysis and non-linear regression, general statistics, statistical graphics
98820C includes	Analysis of variance, Monte Carlo simulation, principal components and factor analysis
Supported peripherals:	
Mass Storage	Any supported by BASIC 4.0§
Printers	Any supported by BASIC 4.0
Plotters	Any supported by BASIC 4.0
Plot-to-file	Both local and SRM files

98820A Ordering Information

98820A	Statistics Library (complete)
98820B	Statistics Library, part I
98820C	Statistics Library, part II
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 650	Software on 5¼-in. flexible disc (external interleave)
Option 655	Software on 5¼-in. flexible disc (internal interleave)
35159A	HP *HelpLine* certificates (package of five)
98820-13112	Statistics Library manual (one included w/98820A, 98820B, 98820C)

* Statistics Library presently requires the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color).

§ File names (including *msus*) are a maximum of 20 characters. This generally limits SRM acces to the current (MSI) directory.

98821A Numerical Analysis

Numerical Analysis is a set of interactive BASIC application programs composed of subroutines that you can incorporate into your own applications. Routines provided include: root finders, integration, ordinary differential equations, linear algebraic systems, Eigen analysis, interpolation, hyperbolic trigonometry, complex math and Fourier analysis.

98821A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
98821A	Num. Analysis programs	Rev. A	Yes*	Yes*	4.0	NA	NA

98821A Specification Summary

Data sheet (for complete specs.)	5953-4699
RAM required (total, stand-alone)	512 Kbytes min.
Disc space used (as supplied)	512 Kbytes

98821A Ordering Information

98821A	Numerical Analysis
Option 630	Software on 3½-in. flexible disc (single-sided format)
Option 650	Software on 5¼-in. flexible disc (external interleave)
Option 655	Software on 5¼-in. flexible disc (internal interleave)
35159A	HP *HelpLine* certificates (package of five)
98821-13112	Numerical Analysis manual (one included w/98821A)

* The Numerical Analysis programs presently require the 98546A compatibility-mode video interface and a 12 or 14-in monitor (monochromatic or color). The routines may be incorporated into user programs on any system configuration supported by BASIC 4.0.

9884A Paper Tape Punch

The 9884A punches paper mylar or plastic tape at speeds up to 75 characters/second. Five, six, seven and eight-bit codes are supported, with optional generation of a parity bit on channel eight.

9884A/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9884A	Paper tape punch	NOP	Planned	Planned	4.0	Inves.	3.1

9884A Specification Summary

Data sheet (for complete specs.)	5953-4342
Dimensions	190mmH, 220mmW, 432mmD
Weight	13.0 kg (15.0 kg shipping)
Punch speed	75 chars/sec., asynchronous
Tape material	Paper, mylar or plastic
Tape width	5-level: 17.5mm (0.69-in.) 8-level: 25.4mm (1.0-in.)
Tape thickness	Paper: 0.08 to 0.13mm (0.003 to 0.005-in.) Mylar: 0.08 to 0.11mm (0.003 to 0.0045-in.) Plastic: 0.08 to 0.11mm (0.003 to 0.0045-in.)
Parity	Odd, even or none (on channel eight only, switch selectable)
AC voltage required	115, 127, 220, 240, +15/-10%
AC frequency tolerance	50 to 100 Hz
AC power required	300 VA max.

9884A/Series 300 Interfacing

The 9884A is interfaced via the 98622A GPIO interface and a unique cable (5060-1854).

9884A Switches & Jumpers	Sample Configuration
DC	On
S3 parity check	No check
S3 stop bits	Don't care
S3 word length	8 bits
S3 parity type	Don't care
S3 punch bit 8	Yes
S3 even parity generation	Off
S3 odd parity generation	Off

9884A/Series 300 BASIC Interfacing

Typical device specifiers	12
Binaries required	GPIO
Binaries optional	IO, TRANS
Programming required	Yes

9884A/Series 300 HP-UX Interfacing

The 9884A has not been tested in HP-UX.

Driver required	`gpio`
Block-mode major number	NA
Character-mode major number	22

9884A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-0
Fields	Select Code	Not Used
Values (hex)	00 to 1E	0000

Typical *mknod* for a gpio card:

```
# mknod /dev/gpio  c  22 0x0c0000
```

9884A/Series 300 Pascal Interfacing

Default volume	None
Modules required	GPIO
Programming required	Yes

9884A Ordering Information

9884A	Paper tape punch
5061-1854	GPIO-to-punch cable (____m)
98622A	GPIO interface
09884-90000	Operating and Service manual (one included w/9884A)
9320-2989	Service Instruction (Facit 4070)
9320-3275	Spare Parts List (Facit 4070)

9885M/S Flexible Discs

The 9885M/S are 500 Kbyte 8-in. single-sided flexible disc drives. The master drives are GPIO interfaced. They are no longer supplied, having been replaced by the 9895A. The versions are:

9885M - single master drive.

9885S - single slave drive. The first 9885S must be connected by a dedicated cable (not HP-IB) to a 9885M. The second and third 9885Ss connect to the preceding 9885S.

9885 media is physically and format-compatible with the 9895A.

9885/Series 300 Support Summary

The 9885M/S discs are not planned for testing/qualification on the Series 300.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9885M	Single master flex disc	Unsup.	Unsup.	Unsup.	Unsup.	No	Unsup.
9885S	Single slave flex disc	Unsup.	Unsup.	Unsup.	Unsup.	No	Unsup.

The Revision A boot ROM contains untested code for the 9885. This code is likely to be removed in future versions of the ROM.

9885 Selected Specifications

Interface and command set	GPIO, unique
Seek time	267 ms average
Average latency	83.3 ms
Transfer rate	23 Kbytes/sec.
Formatted capacity	499200 (per flex. medium)
Bytes per sector	256
Sectors per track	30
Tracks per surface	67 (plus spares)
Surfaces per drive	1
Format options	None
Media	9164-0105 (box of 10)

9885/Series 300 Interfacing

The 98622A Option 002 GPIO interface provides a cable which is compatible with the 9885. 98620A/B DMA is required.

9885-Series 300 BASIC Interfacing

Typical *msus*	:,12,0 or :HP9885,12,0 (Master drive) :,12,1 or :HP9885,12,1 (first Slave drive) :,12,2 or :HP9885,12,2 (second Slave drive) :,12,3 or :HP9885,12,3 (third Slave drive)
Binaries required	HP9885, GPIO
Binaries optional	MS, TRANS
LIF Directories per drive	1

9885/Series 300 Pascal Interfacing

Media specifier letter	F
Default volume	:3 (if first/sole disc)
Modules required	F9885, DMA
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1

9888A Series 200 Bus Expander

The 9888A is an active HP-DIO bus expander for Series 200 and 300 computers. It adds 16 DIO slots (8 I/O), but consumes one I/O slot in the computer mainframe (or 98568A expander). The 9888A adds *no* system slots. Unlike the 98568A Series 300 bus expander, there are restrictions on the type or number of DIO cards that may be installed in the 9888A. The 9888A is user-installable.

9888A/Series 300 Support Summary

Series 300 computers support a maximum of two 9888A expanders. The 9888A is completely transparent to software.

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9888A	DIO bus expander	Rev. A	Yes	Yes	4.0	5.0	3.1

9888A/Series 300 Excluded Cards

The following cards are not supported by the Series 300 when used in the 9888A:

98255A	EPROM card
98254A	64 Kbyte RAM card
98256A	256 Kbyte RAM card
98257A	1.0 Mbyte RAM card
98287A	98700A/H display station interface
98561-66530	Human interface card
98603A	BASIC 4.0 ROM card
98620A/B	DMA card
98625A	Disc interface card
98630A	Breadboard card (or any non-HP card) if Auto-DTACK used
9888A	Buffer board to another 9888A

9888A Specification Summary

Data sheet (for complete specifications)	5953-4625
Dimensions	190.5mmH, 426mmW, 377mmD
Weight	10 kg (14.7 kg shipping)
HP-DIO slots added (total slots)	16
HP-DIO "I/O" slots added	8
Mainframe "I/O" slot consumed	1
System slots added	0
Performance degradation (typ.) (for cards installed in the 9888A)	-6% interrupt I/O -10% DMA I/O -20% 98635A Floating point -26% Burst DMA input
AC voltage required	90 to 125, 195 to 250 Vac
AC frequency tolerance	48 to 66 Hz
AC power required	250 Watts, max.

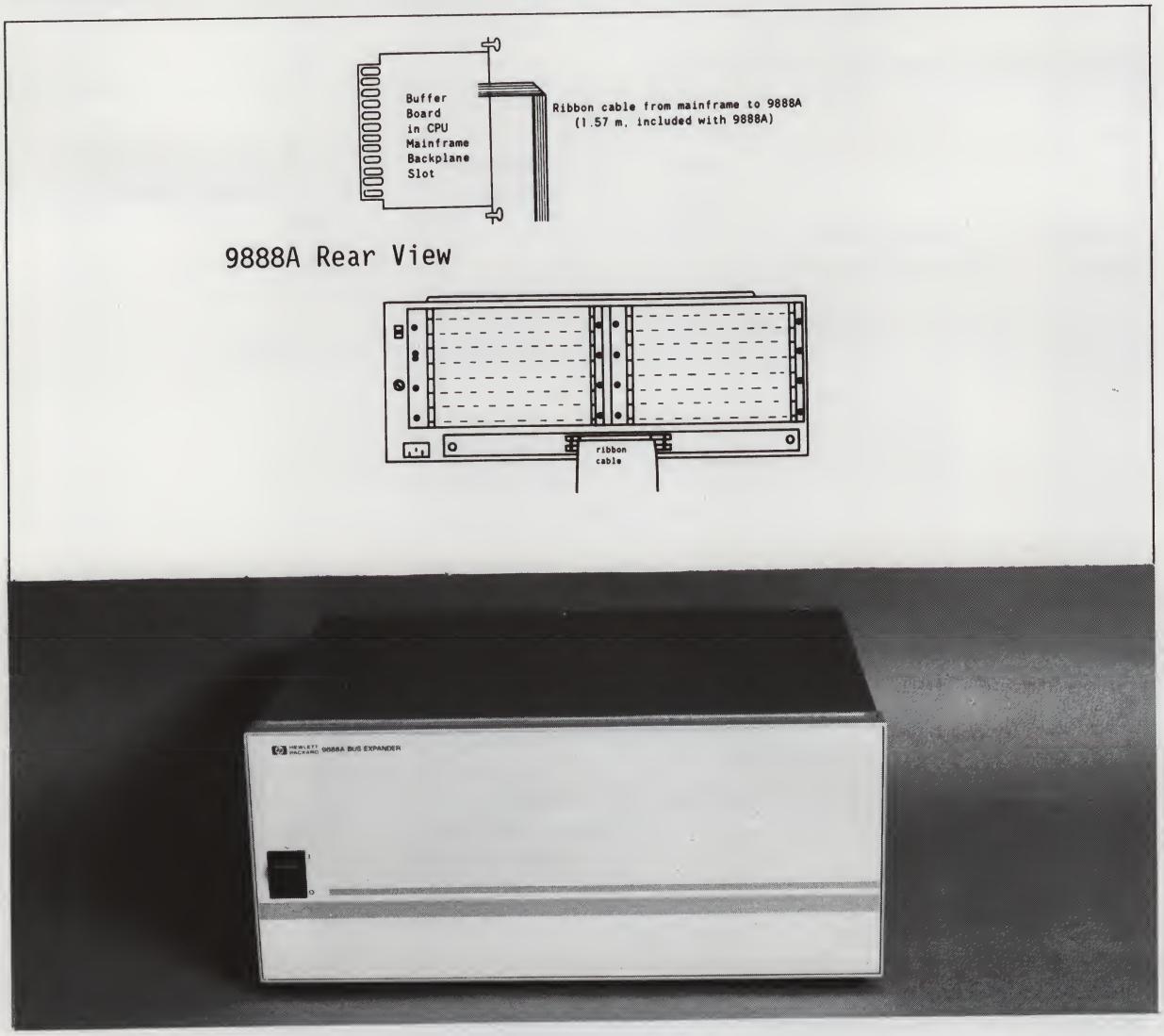
9888A HP-DIO Characteristics

Product Number	Description	Number of Slots	Cover Plate	Select Code Default: Range	9888A Ext. Compatibility	DMA Used
9888A	Effect on mainframe	1	Yes	NA	NA	Opt.
	Effect on system	adds 16	NA	Any	NA	Opt.

I/O cards in the 9888A may employ DMA. The 98620A/B DMA card itself must be installed in the mainframe (or 98568A expander).

9888A/Series 300 Interfacing

There are no switches on the 9888A. The 9888A connects to the Series 300 mainframe (98561) by a 1.6m ribbon cable attached to an "I/O"-style buffer board that installs in the computer mainframe of 98568A expander. If you have two 9888A expanders, both buffer boards must be installed in the mainframe or 98568A.



9888A Ordering Information

9888A	Series 300 bus expander
Option 908	19-in. EIA rack flange kit
09888-90000	Installation and Service manual (one included w/9888A)
5061-0078	19-in. EIA rack flange kit

9895A Flexible Disc

The 9895 is a 1.15 Mbyte 8-in. double-sided flexible disc drive supplied in a 19-in. rack-mountable enclosure. The master drive is HP-IB interfaced and uses the AMIGO command set. Here is a summary of the configurations you may encounter:

9895A - dual master drive. Supports one 9895A Option 011 or 012 slave.

9895A Option 010 - single master drive. Supports one 9895A Option 011 or 012 slave. You can upgrade a single drive to a dual drive with a 98952A kit.

9895A Option 011 - single slave drive. This drive must connect to a 9895A master drive. The 9895A Option 011 is no longer supplied. You can upgrade a slave drive to a master with a 98951A kit. You can upgrade a single drive to a dual drive with a 98952A kit.

9895A Option 012 - dual slave drive. This drive must connect to a 9895A master drive. The 9895A Option 012 is no longer supplied. You can upgrade a slave drive to a master with a 98951A kit.

The 9895 can format, read and write both double-sided and (9885) single-sided media. The 9895 is also compatible with IBM 3740 media and formats, although no conversion software is available.

All versions of the 9895A will no longer be supplied after May 31, 1986.

9895/Series 300 Support Summary

Product	Description	Min. Boot ROM	Hardware Support		Earliest Operating System Version		
			310	320	BASIC	HP-UX	Pascal
9895A	Dual master flex disc	Rev. A	Planned	Planned	4.0	5.1	3.1
9895A#010	Single master flex disc	Rev. A	Planned	Planned	4.0	5.1	3.1
9895A#011	Single slave flex disc	Rev. A	Planned	Planned	4.0	5.1	3.1
9895A#012	Dual slave flex disc	Rev. A	Planned	Planned	4.0	5.1	3.1

The *mediainit* disc formatting command in HP-UX 5.0 cannot format AMIGO discs. The *mkfs* or *lifinit* commands should be able to create a useable file system if the disc is formatted on another system (such as BASIC, Pascal).

Although the 9895 is supported, no Series 300 software is supplied on 8-in. media.

9895 Specification Summary

Data sheet (for complete specifications)	5953-6857
Interface and command set	HP-IB, AMIGO
Dimensions	192mmH, 575mmW, 483mmW
Weight (dual drive)	26.8 kg (31.8 kg shipping)
(single drive)	20.9 kg (25.9 kg shipping)
Access time 179 ms average	
Average latency	83 ms
Transfer rate	10 Kbytes/sec.
I/Os per second	5

9895 Specification Summary, continued...

Formatted capacity (per medium)	1 182 720 bytes double-sided 499 200 bytes single-sided
Bytes per sector	256
Sectors per track	30
Tracks per surface	77
Surfaces per drive	2
Format options	Determined by media
Media	92195A (double-sided, box of 10) 9164-0105 (single-sided, box of 10)
AC voltages	100, 120, 220, 240 ±10%
AC frequency tolerance	50 or 60 Hz, ±2%
AC power required	190 VA max. (dual master) 130 VA max. (single master)

9895 HP-IB Characteristics

Product Number	Description	Device Addresses	Address Range	Std. Loads	Rate Modes	Internal Bus Cable	Cable Included
9895A	Dual master flex. disc	1	0...7	1	N or H	0.0m	None

Master "drive 0" and "drive 1" are UNIT 0 and UNIT 1, respectively. Slave "drive 0" and "drive 1" are UNIT 2 and UNIT 3 regardless of whether the master disc has one or two drives.

9895A/Series 300 Interfacing

The 9895 may be used with any HP-IB interface. 98620 DMA will not provide significant performance improvement. The examples which follow assume a built-in HP-IB at select code 7 and a 9895A at bus address 2. See 98624A for HP-IB cabling rules.

9895 Switches	Sample Configuration
HP-IB address	2

9895A Suggested Interleaves

	HP-IB Interface Used		
	98624A	Built-in	98625
Without 98620 DMA	4	4	4
With 98620 DMA	4	4	4

9895A/Series 300 BASIC Interfacing

Typical *msus*	:,702,0 or :HP9895,702,0 (drive 0) :,702,1 or :HP9895,702,1 (drive 1)
Binaries required	HPIB and DISC (or FHPIB)
Binaries optional	MS, TRANS
LIF Directories per drive	1 or 2

9895A/Series 300 HP-UX Interfacing

Mountable volumes per drive	1 or 2
Driver required	amigo
Block-mode major number	2
Character-mode major number	11

9895A/Series 300 HP-UX Driver Minor Number

Bits	23-16	15-8	7-4	3-0
Fields	Select Code	HP-IB Address	Unit Number	Not Used
Values (hex)	07 to 1F	00 to 07	0=master 0 1=master 1 2=slave 0 3=slave 1	0

Typical *mknod*s for 9895A at select code 7, bus address 2

```
# mknod /dev/fd.0    b  2 0x070200
# mknod /dev/rfd.0   c 11 0x070200
# mknod /dev/fd.1    b  2 0x070210
# mknod /dev/rfd.1   c 11 0x070210
```

9895A/Series 300 Pascal Interfacing

Media specifier letter	H
Default volumes	:3 and 4 (if first/sole disc) :7 and 8 (if second flexible disc)
Modules required	DISCHPIB, AMIGO, and DISC_INTF (if using 98625) and DMA (if using 98620 DMA)
Modules optional	ASC_AM, LIF_AM, TEXT_AM, WS1.0_AM
LIF Directories per drive	1 or 2

9895 Ordering Information

9895A	Dual 8-in. flexible disc drive
Option 001	50 Hz operation
Option 010	Delete second drive mechanism (single master drive)
09895-88022	19-in. EIA rack-mount kit. For mounting in HP racks, also order
12679C	racking support rails.
10833A	1.0m HP-IB cable
10833B	2.0m HP-IB cable
10833C	4.0m HP-IB cable
10833D	0.5m HP-IB cable
8120-3448	4.0m HP-IB cable
8120-3449	8.0m HP-IB cable
82977A	1.0m right-angle HP-IB cable
82977B	2.0m right-angle HP-IB cable
9164-0105	Single-sided flexible discs, box of 10
92195A	Double-sided flexible discs, box of 10 (2 discs supplied w/9895)
92220R	0.3m right-angle HP-IB cable
98951A	Control board (converts slave 9895A Option 011 or 012 to master)
98952A	Second drive (converts 9895A Option 010 or 011 to dual drive)
Option 001	required if single drive was also Option 001

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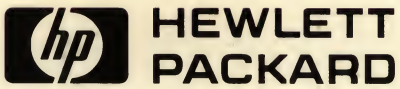
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